CHEMISTRY OF FOOD

J. B. S. KING M. D.

Practical Observations

upon the

CHEMISTRY OF FOOD

and

DIETETICS

BY

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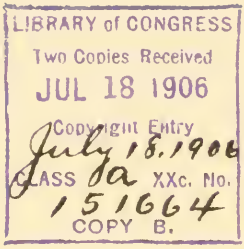

DEDICATED TO THE

MEMORY

OF

DR. CLARENCE WILLARD BUTLER

of Montclair, N. J.

Gentleman : Physician : Scholar

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INTRODUCTION.

There has probably never been a time when the attention of the public has been more generally directed toward the care of the health than the present. Every newspaper in the land seems to have a column or a corner devoted to the development of the body, to the care of the skin, to the obliteration of wrinkles, to the attainment of beauty or to some phase of the care of the body.

Magazines devoted to physical culture, to diet, to vegetarianism, etc., are widely circulated and read; there are books devoted to the thesis that fruit acids are deleterious and poisonous, and other books to prove that they are indispensable. Pseudo-scientific articles attempting to show that potatoes produce large abdomens, that tea causes the teeth to protrude, that carbohydrates have the effect of overdeveloping the chin, that onions relax the jaw tissues, and a host of like absurdities, have appeared in popular magazines. Books have been written which try to prove that all our ills come from uric acid foods, and many essays and pamphlets to show that that proposition was not true.

Then there are raw-food people and vegetarians and partial vegetarians and nutarians and fruitarians; also there are grape cures and apple cures and milk cures and hunger cures and thirst cures. The stores are full of malted foods and steamed foods and digested foods and concentrated foods and health foods, and finally, after seventeen years

of unrighteous opposition on the floor of the United States Senate, the Pure Food Bill has passed.

All of which goes to show that the popular mind has been awakened and directed, however mistakenly, toward the subject of the care of the body. As is often the case, the medical profession is lagging in the rear. Nothing corresponding to the popular interest in the subject has been awakened in the professional mind. There is probably no subject connected with the care of patients that doctors are so perplexed by as diet. Many physicians have their ideas of diet based purely on prejudice; what happens to agree with them personally they recommend to their patients, and what disagrees with their particular organism they sternly forbid. The questions most frequently propounded to doctors by patients probably relate to the diet, and the most confusing and inaccurate directions that patients receive from doctors relate to the same important subject. A knowledge of the principles common to all foods, and the function of each, is indispensable to a physician. A knowledge of the proportion of these constituents in many of the standard foods should follow, and would be found of the greatest advantage in practice. A knowledge of the general principles of cooking is also extremely useful.

These considerations, together with the fact that the branch of dietetics which relates to standard dietaries has very recently undergone changes so great that they are little short of revolutionary, seem to indicate that a concise book upon the subject embodying the latest views might be welcome.

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March, 1906.

GENERAL PRINCIPLES OF NUTRITION.

Chemical Constituents of Food.

Human food in the complex must contain all the elements of the human body. The elements of the human body are as follows:

Carbon, hydrogen, oxygen, nitrogen (gaseous).
Potassium, sodium, calcium, magnesium (mineral and basic).
Phosphorus, sulphur, chlorine, iodine (*mineral and acidulous).
Silicon, iron (mineral and metallic).

Traces of other elements, such as arsenic and copper, are found in minute quantities, but the above are all that are of practical interest so far as the study of nutrition goes.

None of the above elements exists in a free state, either in food or in the body; they are all chemically combined to form certain compounds, and it is these compounds that are to be studied as the principles of food. The first of these is

Water.—Composed of the elements hydrogen and oxygen of the above list; it is the universal medium, diluent and solvent, found in all foods and indispensable to life. It is not decomposed in the body, and hence furnishes no energy; various foods

*Chlorine, although a gas, is here classed with acidulous minerals on account of its analogy to iodine.

contain from 10 to 95 and the human body 70 per cent of it.

Mineral Matters.—These are alkaline and earthy salts; they consist of calcium, magnesium, potassium and sodium, combined with sulphuric and phosphoric acids to form sulphates and phosphates, and with chlorine to form chlorides. Phosphorus, sulphur and iodine also exist and perform important functions, in combination with organic albumins. Sodium chloride is found in larger proportion in the serum of the blood, potassium chloride in the red blood corpuscles and in muscle cells, potassium phosphate in the brain and nerve tissue; calcium, magnesium and silicon in the cartilages, bones and teeth; iodine in the glands, and iron in the red corpuscles.

There are about seven and one-half pounds of mineral matter in an average sized man, five-sixths of which is in the osseous framework. Five per cent of the whole body consists of mineral matters; they are absolutely essential to life, and even if all the other constituents of food are furnished, death occurs after about one month of their absence. The daily intake and output of mineral matter is about 400 grains, something less than an ounce, and would be fully supplied by ordinary food, even without the extra additions of common salt that the cook usually adds.

The most important minerals are lime, soda, iron and phosphoric acid. Phosphorus plays an important role in nutrition; in addition to its usefulness in building the bony tissues, it is an essential of cell activity. Next to the bones, the brain and nerves are rich in phosphorus. Strange to say, the ligaments and tendons, whose function is so similar to

bones, contain the least phosphorus of any animal tissue. The daily need of iron is very small, only about one-sixth of a grain, and that amount is easily contained in ordinary food.

PROTEIN.—Nitrogen is the characteristic element of this class. It includes the most essential as well as the most worthless of foods. The American Association of Agricultural Colleges and Experiment Stations adopted and recommended the term protein, in place of proteid, albumin, albuminoids, nitrogenous foods, etc., employed by various writers, and this name is here used.

Protein may be divided into three classes, albuminoids, gelatinoids and extractives. (Note I.)

Albuminoids include the white of egg, the lean of meat, the casein of milk and the gluten of wheat. These are indispensable; life cannot be maintained without them. They build up new tissue during the period of growth; they repair the waste of tissue in adult life and, by virtue of the carbon and hydrogen that they contain, they also contribute to the heat and energy of the body.

Gelatinoids occupy a very secondary position, for the reason that their nitrogen is not available for the repair of tissue, as is that of the albuminoids; they save the latter from being consumed, however, and leave it intact to perform its tissue-building, instead of being used up in energy; hence they are sometimes called albumin-sparers. Gelatin is a familiar example of this class; glue is an impure form of it.

Extractives come under this head only because they contain nitrogen; they furnish scarcely any strength to the body and are very hard to eliminate, being potent producers of uric acid. They serve

as stimulants and appetizers. The agreeable savor of cooked meats is largely due to extractives, and they form the principal part of the commercial meat extracts.

The above facts are shown in a summary in the following table:

CONSTITUENTS OF FOOD IN GENERAL.

WATER		Hydrogen and Oxygen.	The universal diluent and solvent
MINERALS.....	Earthy and Alkaline Salts.	Calcium, Magnesium, Sodium, Potassium, Phosphorus, Chlorine, Sulphur, Iron, and Silicon.	Necessary to osmosis, and assimilation: maintain the alkaline reaction of the tissues.
HYDROCARBONS..	Fats and Oils.	Carbon, Hydrogen, Oxygen.	Heat and Energy.
CARBOHYDRATES.	Starches, Sugars, Gums.	Carbon, Hydrogen, Oxygen.	Energy and Heat.
PROTEIN.....	Meat, Fish, Eggs, Peas, Grains, Beans, Cheese, Gelatine.	Nitrogen, Carbon, Hydrogen, Oxygen.	Tissue builders and repairers. Energy and Heat.

THE FUNCTIONS OF FOOD.

It may be seen from the above that food has a threefold function: First, it must supply animal heat; second, it must supply energy for work; third, it must furnish the elements for growth and for the replacing of worn-out tissue.

Animal heat is supplied by all the foods containing carbon; in the highest degree by fats and oils; in a considerable degree by sugars and starches and also by protein.

Functions of Food.

Energy for work is furnished largely by the starches and sugars and also by the fats and oils. Protein is also capable of furnishing energy with great rapidity.

The building and repair of tissue is the peculiar function of protein. It will be noticed that protein alone is capable of fulfilling all the functions of food, and this universality of use gives it its great prominence. Instances can be cited where men have lived for long periods of time with a high degree of vigor and well-being upon nothing but water, meat and salt. Such a highly nitrogenous diet, however, requires an active life in the open air, and even then should not be maintained indefinitely.

For reasons hereafter stated it seems desirable that the protein consumption should not be much in excess of the amount required to make good the tissue waste, and that most of the requisite heat and energy of the body should be derived from the carbohydrates and fat, rather than from protein.

The comparison of the human body to a steam engine is so old that, when used now, it is generally with an apology for its triteness. It is, notwithstanding, a very useful and apt illustration of many things about nutrition. Thus the protein that maintains the integrity of the tissues may be compared to the steel and iron that replace old and worn-out parts and keep the engine in repair.

The carbonaceous food that supplies animal heat and the ability to do work is like the coal that makes the steam pressure. The comparison may easily be extended with advantage to the subject of excreta.

The burning of coal under the boiler and the digestion of food in the body are essentially alike in that they are processes of oxidation or combustion, the inevitable result of which is waste products or ashes.

If the coal is of good quality and in proper quantity, the ash is fine and completely burned. If of poor quality or in too large quantity, clinkers and incompletely consumed cinders is the result. If the draft is slow or the supply of air deficient, cinders are again in evidence.

Normal urine and feces represent the fine, well-burned ash of good coal. Uric acid crystals, amorphous urates and phosphatic sediments in the body or urine, from overeating or from improper food, correspond to the clinkers and half-burned cinders from bad coal or too much fuel that clog the fire. When resulting from insufficient exercise or scanty intake of oxygen, as in the damaged lungs of a consumptive, they represent the same thing when occurring from choked draft.

The smoke and vapors that escape through the chimney represent the expired air and the gaseous waste of the system. An important difference is that the human engine builds its own parts, repairs its own breaks, oils its own joints, frees its own pipes and keeps up its own fires, with an economy and perfection that the best mechanism of man only clumsily and inadequately imitates. (Note II.)

Standard of Value.

One of the inherent difficulties of the subject of diet has been to fix some standard by which the relative nutritive value of food might be measured.

Of late years a standard of value has been adopted, called the Calorie, which allows of a much more accurate comparison of various foods than was formerly possible. It is based upon the fact that the digestion of food is essentially the combustion of food, and the amount of heat evolved by the complete combustion of a certain amount of food has been found to be the best index of its nutritive value that we have.

The amount of food used in the experiment is one gram (15½ grains).

The standard of heat production is called a Calorie, written with a capital, and means the amount of heat required to raise one liter of water one degree Centigrade (or one pound of water four degrees Fahr.). To ascertain the value of any food by this standard one has to find out how many degrees Centigrade one liter of water is raised by the complete combustion of one gram of the food in question. The result gives the value of the food in terms of Calories. It is freely admitted that combustion outside the body and digestion within it are not strictly convertible terms, especially in regard to protein, yet even with this admission, it has been found that no other method of comparison gives such an accurate idea of food values. The fuel value of one gram of each of the three important constituents of food, according to the most recent experiments, made by Atwater, is as follows: (Note III.)

Protein	4	Calories
Carbohydrate	4	"
Fat	9.1	"

To apply the Calorie standard to any food it is only necessary to know its chemical composition, and then to multiply the percentage of protein and carbohydrate by four and the percentage of fat by 9.1. The result gives the number of Calories afforded by 100 grams of the food.

For example: Eggs contain, according to the average of sixty analyses, 14.8 per cent of protein, 10.5 per cent of fat and no carbohydrate to speak of. Then

$$\begin{aligned} 14.8 \times 4 &= 59.2 \\ 10.5 \times 9.1 &= 95.5 \\ \hline & 154.7 \end{aligned}$$

Therefore, the value of 100 grams of eggs (two average sized eggs) is 154.7 Calories.

If a sample of milk contains 4 per cent of protein, 5 per cent of sugar and 4 per cent of fat; then the Calorie value of 100 grams (3 1-3 ounces) would be

$$\begin{aligned} 4 \times 4 &= 16 \\ 5 \times 4 &= 20 \\ 4 \times 9.1 &= 36 \\ \hline & 72 \end{aligned}$$

The usefulness of the Calorie standard is very great, but it should not be overestimated nor considered as more than one factor, though an important one, in the comparison of foods. Ease of digestion, rapidity of digestion, completeness of absorption and cost must all be considered in putting a definite value upon an article of diet. Sawdust, for instance, would give at least as high a

Calorie value as starch, but owing to its indigestibility is of no nutritional value whatever.

In order to give an idea of the fuel value of some common foods, the number of Calories yielded by 100 grams is given in the following table. One hundred grams (3 1-3 ounces) would not be far from the amount of edible substance in an ordinary helping of meat, eggs or potato at a meal.

		Calories.
100 grams (3 1-3 oz.)	medium fat pork	285
" " "	bacon	620
" " "	beef	170
" " "	cheese	411
" " "	oats	396
" " "	wheat	339
" " "	rice	347
" " "	white bread	263
" " "	johnny cake	248
" " "	milk	72
" " "	eggs	154.7
" " "	potato	66

The Calorie value of the food for twenty-four hours of a man of average weight should be from 1,500 to 3,000. The lower number for a sedentary life, the higher when engaged in active labor.

Absorbability of Food.

In estimating food values the question of the ease and completeness of its absorption becomes an important factor. The carbohydrates (starch and sugar) of all kinds of food seem to be absorbed to the last particle; cellulose, although of the same percentage composition as starch, is not absorbed

at all, yet counts equally in estimating Calorie values. Of all this class fruit sugar (glucoses) enters most rapidly into the blood, cane sugar (saccharoses) next and starch (amyloses) the least rapidly.

Fat is very completely absorbed, but not with great rapidity; the ease with which various fats are absorbed depends largely upon their melting point; the lower the melting point the more readily it yields to the digestive organs, and *vice versa*.

Protein from animal sources is more readily and completely absorbed than that from the vegetable kingdom. The completeness of protein absorption depends upon its relative amount; when the per cent is small there is a greater waste than when the amount is greater. This is probably due to its entanglement in the larger proportion of cellulose and starch present, so that it escapes the direct action of the digestive juices.

The protein of meat and eggs, for instance, is completely and easily absorbed, less than 3 per cent being wasted, while the protein of peas is wasted to the extent of 10 per cent, and that of potatoes to the extent of about one-third. Vegetable food, in general, shows a much greater loss of protein than do meat and eggs. When we come to consider the absorption of the whole food, however, which is a fairer point of view, we find that, so far as the important vegetable foods go, they exceed meat as a whole. Thus, of white bread only 4 per cent is wasted, while of the whole meat (not protein alone) about 5 per cent is lost. Fine white bread is absorbed more completely and yields more heat and energy than the coarse breads. This is con-

trary to the statements made by many food journals and even by works on the subject, but is nevertheless correct. The point was proved by experiments made in the laboratory of the University of Minnesota in 1890. (Note IV.)

The coarser breads, however, contain more of the various constituents of the grain and are a better food for growing children and for those leading sedentary lives.

Elimination.

There is no fire without ashes, and the fire of life is no exception to the rule. The insoluble debris of food, the waste products of combustion and the detritus from the decay of tissue, all produce a quantity of effete matter that must be gotten rid of, in order that the body may be in a clean and healthy condition.

The waste and useless end-products of combustion in the body issue forth in various ways, through organic pipes and tubes, which may be compared to the sewers of a city; the carbon appears as carbon dioxide in the expired air from the lungs, and as carbonates of the alkalies and alkaline earths in the urine and perspiration.

Hydrogen escapes as water by the same routes. Phosphorus, sulphur and chlorine unite with oxygen, forming acids, which, in turn, combine with the alkalies and earths to form soluble salts, which appear in the urine.

The greater part of the nitrogen (85 per cent) appears in the urine as urea, a soluble neutral crystalline body; a part also appears as a hard, gritty, insoluble, crystalline, bi-basic acid, known as uric acid.

Between the food as it enters the mouth and its ultimate waste products that leave the body there is a multitude of intermediates concerning which we are far from possessing complete knowledge.

This much is known: The products of carbon metabolism, consisting, as they do, of carbon dioxide and water, are comparatively easy for the eliminative organs to handle. Owing to their fluid and gaseous nature they are not capable of seriously encumbering the system. The worst thing that they can do is to produce an excessive formation of fat, which, while not desirable, is not in itself poisonous. The same innocuousness does not go with the products of nitrogenous metabolism. These form a series of hard, more or less insoluble, crystalline bodies that are passed along from tissue to tissue and from organ to organ with difficulty, and are prone to encumber and obstruct the organs through which they must pass and also to fret and injure their structure.

Nor is it mere mechanical obstruction alone that characterizes them; most, if not all, of these tissue-fretting bodies exert a positive toxic action upon the system. Xanthin, hypoxanthin, creatin, creatinin, adenin, ammonium carbamate, urea and uric acid are some of the principles that are known to exert a poisonous influence when present in the body in slight excess.

All flesh foods contain these substances; they are also formed to a slight extent in our own tissues and from the digestion of vegetable protein. Such facts as we possess make it clear that excess of protein, especially of animal origin, is more harmful to health than excess of carbohydrates or fat. The many varieties of gout and innumerable

obscure diseased states have their roots in this nitrogenous debris-encumbered condition of the system.

Thorough elimination means clean tissues, and clean tissues mean vigor, flexibility and endurance. It is evident from the foregoing considerations that nitrogenous foods clog the system more than others, and it is an obvious inference that too much of that kind of food is especially to be avoided. Attention and appreciation of these facts should impress upon the mind the importance of avoiding all excessive ingestion of food. It is by ingestion that elimination may be controlled, and the regulation of the intake of food is the only proper and orderly way to control it.

It is most unfortunate that the public has been educated to regard catharsis as the key to proper elimination. The effects of overindulgence, gluttony and improper foods are supposed to be promptly relieved by a cathartic pill, and this unscientific delusion is fostered by numerous patent medicine advertisements in the daily press. The profession should endeavor to teach the laity that the evacuation of the bowels is the last and outermost of a long series of internal purifications, and that to force them to overaction is to begin purification at the wrong end. It is certainly a very inadequate corrective of improper eating.

The Daily Amount of Food.

As the result of many years' observation and experiment, certain amounts of each of the three chief food principles have been set down as necessary for the preservation of health and strength.

The necessary data were obtained by the so-called empirical method, that is, by observations made upon healthy individuals eating as much as they wanted of what they pleased. The food consumed was analyzed and the amounts of protein, carbohydrate and fat determined. The excreta during the same period were also analyzed, so as to show whether the income of food and the outgo, as represented by the excreta, were balanced or in equilibrium.

The quantities thus obtained by various observers, acting independently, were in fairly close agreement with each other and averaged about as follows:

Protein, 120 gm. (4 oz.); fat, 50 gm. (2 oz.); carbohydrate, 500 gm. (17 oz.).

It should be understood that these figures refer to dry material and not to food in its ordinary condition. Translated into quantities of food such as we handle and eat, it would be about as follows:

Beef, 13 oz.; butter, 2 oz.; potatoes, 6 oz.; bread, 20 oz.; for the meals of twenty-four hours. The Calorie value is about 3,400.

There seems to have been a very general agreement by authorities on the subject (up to very recent times) that the above quantities of food constituents were the minimum amount required by a man of average weight doing a moderate amount of muscular labor. Diminution in the protein was considered the most dangerous feature of underfeeding, and the hardest to recover from. It is only of very recent date that these figures have been criticized or questioned. The general principle that the ideal diet consisted of the smallest amount of protein (with carbohydrate added) that

would serve to keep up body weight and vigor was emphasized by all investigators. The difficulty was that when it came to experiment, the data were gathered from human appetites and desires rather than from the actual needs of the body.

When we reflect upon how much of self-indulgence and gratification of the palate and how little of thought enters into the selection of what and how much we eat, we may realize how unsatisfactory and misleading must be the results deduced from such experiments.

Mr. Horace Fletcher was the Columbus who, with the aid of a professional man, Dr. Van Someren, first pointed out that exceptional health and vigor could be maintained upon about one-half the amount recommended in the accepted dietaries.

The visit of Mr. Fletcher to the Yale University was epoch-making. He succeeded in interesting Prof. R. H. Chittenden, director of the Sheffield Scientific School, to such an extent that he was put in Professor Chittenden's laboratory for a period of thirteen days for the purpose of exact observation. The result was that a daily allowance of protein, 44.9 gm. (1½ oz. nearly); fat, 38 gm. (1¼ oz.); carbohydrate, 253 gm. (8½ oz.), kept Mr. Fletcher in nutritional equilibrium, although his weight is 165 pounds. The Calorie value of his food was about 1,600 per diem.

Then followed those well-known observations upon thirteen United States soldiers for a period of six months, which demonstrated that excellent health, increased vigor and full body weight could be maintained upon a dietary consisting of about one-half of the protein called for in standard dietaries, and this without any increase in carbohydrate.

These results were further extended and confirmed by experiments upon five professional men and eight trained athletes, one of the latter winning championships in two college events while under the restricted diet.

These experiments were made upon different types of men and extended over sufficiently long periods of time to prove conclusively that there is no need for such quantities of food as the prevalent dietary standards call for. Health that was exceptional and increased vigor are fully proved thereby to be compatible with an amount of protein less by one-half, without any increase in fat and carbohydrates, than is demanded by the figures of Voit, Atwater and others. It is safe, in view of these recent experiments, to put the standard dietaries upon a new basis. There is no real physiological need for more than: Protein, 50 gm. (1¾ oz.); fat, 50 gm. (1¾ oz.); carbohydrate, 480 gm. (16 oz.).

This translated into quantities of plain food in its ordinary condition (not water free), would be: Beef, 5¾ oz.; butter, 1¾ oz.; potatoes, 6 oz.; bread, 10 oz., for twenty-four hours, of which the Calorie value would be about 2,500.

An inevitable defect about averages is that, however true, they may not be applicable to particular individuals. It may be absolutely true, for instance, that the protein needs of a thousand men will average 120 gm. (4 oz.), but John Roe may be better off on that amount, and Richard Doe on one-half that amount. Moreover, what is applicable to a man at rest would be too little for him when at hard work, and as in daily life work cannot be measured, the varying needs of the individual

must be largely guesswork, notwithstanding scientific averages. Professor Chittenden does not say that his subjects received just the proper amounts of food for their daily needs; he simply claims to have demonstrated that health and vigor can be maintained on much less food than science has heretofore set down as the minimum. This was much, but there must be a "better way," according to Mr. Fletcher's phrase, for the individual to determine the kind and amount of food needed by the body for the varying factors of the rest and work of daily life.

This is the problem that Horace Fletcher has settled for all intelligent people who are willing to receive the information and pay the price of a little self-denial. With a full appreciation of the labors of Voit, Moleschott, Atwater, Playfair and others, it will one day be acknowledged that this simple discovery of Horace Fletcher (a layman) outweighs, or at least equals, in practical benefit to humanity all the valuable results obtained by these skilled professional scientists.

What is this momentous discovery that teaches what food to eat to meet the individual's needs, and how much to eat at a meal to match the ever-varying factors of rest and work, far better than averages deduced by the most stupendous labors from thousands of analyses?

It is so simple that it seems lamentable, and even ridiculous, that it has not been discovered before. Hundreds of books on the physiology of digestion have mentioned the importance of chewing the food, but none of them with the emphasis necessary to change one's habits entirely and produce far-reaching benefits. This discovery is simply the mas-

tication of each mouthful of food until no taste is left in the morsel and the deglutition has been an involuntary process. Its simplicity is one of the formidable difficulties in the way of its general adoption; people will climb mountains, take nauseous drugs, endure all kinds of disagreeable treatments to regain lost health, but this is *too* simple. Moreover, even when the mind is convinced and one starts in with the novel method, such is the inveterate persistence of long-standing bad habits that for a long period eternal vigilance becomes the price of rational mastication.

The method by which I have succeeded best in getting people to break up the life-long bad habit of premature deglutition is by the following steps, mostly taken from or suggested by Mr. Fletcher's "A-B-Z of Our Own Nutrition:"

First. REFLECTION upon what you are about to eat. Do you really want it, or are you going to eat whatever is put before you, simply because you have formed a habit of eating at this time? Be sure about this before you eat anything. Better go without a meal than put food that is not needed into your stomach, or eat simply because it is a habit.

Second. ATTENTION to each mouthful. It must be masticated and insalivated as long as there is any taste in the morsel. *It must not be swallowed* until one is compelled to by the involuntary action of the faucial muscles. It is best not to talk while eating, until you have formed the habit of proper mouth digestion; at first this will require the whole attention.

Third. APPRECIATION.—It leads naturally to appreciation of flavors and savors unknown before, and such as the bolter of food can never know.

Observance of these three rules gradually leads to

INSTINCTIVE KNOWLEDGE of what supplies the needs of one's system, and the proper quantity of it. After a time some things that you were fond of will grow distasteful, which will show that they are not good for you, and some plain foods, that you were indifferent to, become sweet and attractive. There will follow

EVACUATION of dry stools, less frequently, less in amount and less malodorous than under ordinary habits.

CHEMISTRY OF SPECIAL FOODS.

Milk.

Milk is a complete food, furnished ready for use by nature. It is a kind of epitome of food in general, for representatives of each of the important principles of nutrition are found in it, namely, protein, carbohydrate, fat, salts and water. It furnishes, moreover, a fine example of the exquisite adaptation of nature's products to the end in view, for the milk of every animal is accurately fitted by its composition to the needs of the young for whom it is intended. For instance, the milk of the walrus, whale and seal is excessively rich in fat—ten times richer than cow's milk—with the evident purpose that the young animal may be enabled to resist the rigors of the Arctic winter by an abundance of this heat-producing principle.

The solids in cows' milk amount to about 13 per cent. They are: Protein, 4 per cent (3.5 casein, .5 lactalbumin); fat, 4 or 5 per cent; milk sugar, 4 per cent; mineral salts, .7 per cent. These are the average amounts only, for it must be remembered that milk varies greatly in composition; this is owing not only to adulteration but also to the quantity and character of the fodder given the cows.

Casein.—The chief nitrogenous constituent of milk is casein; it differs from other protein com-

pounds in containing both phosphorus and sulphur, and is the principal material out of which the tissues of the young are constructed. Heat does not coagulate it, but it is very easily clotted or curdled by the action of acids and by rennet. Casein contains no nuclein. Since nuclein is the chief source of uric acid, it is important to know this when selecting a diet for cases in which uric acid is deleterious. Moreover, it differs from other proteins in yielding carbohydrate with difficulty when split up by the digestive process, a fact which should make it of special value in diabetes mellitus.

The only other protein of milk is lactalbumin; it is present in cows' milk in the proportion of about one-seventh of the total protein. It differs from casein in being coagulated by heat, and constitutes the skin which forms on milk when boiled. In human milk it forms one-half the total protein, and this fact furnishes a key to the frequent occurrence of indigestion from tough curds of casein in infants fed upon cows' milk. The total protein of cows' milk averages 4 per cent. The curd artificially precipitated by an acid or from spontaneously soured milk is casein, with the butter entangled in it; it is soluble in a weak alkali.

Butter.—The fat of milk is butter and is present in about the proportion of 4 per cent. Owing to its low melting point, its fine emulsification and the extraordinarily large amount of fatty acids in its composition, it is one of the most easily digested of fats. Even when so large a quantity as one-quarter pound per day is consumed, less than one-half of 1 per cent is unabsorbed, which is a better result than can be obtained from any other animal fat, with the possible exception of the fixed oil of

egg yolks. Owing to its palatability it is a very valuable aid in the dietetic treatment of diabetes.

CARBOHYDRATES.—Lactose or milk sugar is the carbohydrate of milk; with glycogen from the liver and honey from the bee, it comprises the only carbohydrates from the animal kingdom. It is less soluble, less sweet and less susceptible to fermentation than cane sugar, though, like it, its molecule contains 12 carbon atoms. In the presence of warmth and certain very common micro-organisms, it is easily converted into lactic acid, which is the cause of milk turning sour and curdling when allowed to stand in a warm place. Cows' milk averages 4 per cent of milk sugar; human milk contains about 7 per cent, and hence is considerably sweeter. Skimmed milk and separated milk, that is, milk from which the cream has been removed, owe their highly nutritious quality to the lactose and casein which still remain, together with such a minimum of fat as has escaped the process. Bread made with skimmed milk is decidedly stronger in nutritive qualities than ordinary bread, as has been proved by analyses in the University of Minnesota.

MINERAL MATTER.—Salts are present in the proportion of 0.7 per cent, and they vary less than any of the other constituents of milk. The salts are present in exactly the proportion that they exist in the body of the animal that they are designed to nourish. The phosphates, chlorides and sulphates are in much the same proportion that they are in the blood. Potassium salts are in larger proportion than sodium salts; they supply muscular tissue, while the latter are found more in the fluids of the body. The calcium, which is abundant, plays an

important and necessary role in the growth of the cartilages and bones.

The only deficiency in milk is iron; this metal is very scantily represented. There is only about one grain in five gallons of milk, and it would take a large volume to supply an adult with his daily quantum of iron. Hence, under an exclusive milk diet, one is apt to gradually become anæmic. The new-born infant is stocked up, so to speak, with iron when it arrives in the world, and this excess serves the needs of its body until it begins to take other food. Another constituent of milk that plays an important role as a preventive of scurvy and rickets is citric acid in combination with calcium. It is present in considerable quantity and forms the gritty, tasteless deposit often noticed in condensed milk. Boiling the milk probably alters the citric acid salt in some way, for children raised on boiled milk are very obnoxious to rickets and scurvy.

Eighty-five to 88 per cent of milk is water, and this fact makes it too bulky for a perfect food for adults as it is frequently claimed to be. It also affords the possibility of a great variation in the strength of the fluid without any very obvious change in its physical properties; probably no food presents such a wide variation in its percentage composition as does milk.

From all this it will be seen that milk is an absolutely perfect food for infants; it contains the necessary salts and the relative excess of protein for the increasing body of a young and growing animal, but these very facts render it inappropriate as an exclusive or perfect food for the adult.

For the adult the 88 per cent of water makes

milk too bulky; in order to bring the solids and Calorie value up to that indicated in standard dietaries, nine or ten pints would have to be consumed daily, a volume of fluid that would throw an excessive amount of work upon the kidneys. Then, again, the amounts of protein and fat relative to the carbohydrates are such that, in order to get enough of the latter, far too much of the former would have to be consumed. As has been stated, protein is the most difficult of the nutritive principles for the body to eliminate and, therefore, the one whose excess is most injurious.

If the excess of protein is balanced by a carbohydrate the difficulty is at once removed, and the natural instincts of appetite have seized upon such combinations as favorite dishes; such are bread and milk, rice and milk, corn starch and milk, etc. How much this reduces the bulk of one's diet is illustrated by this:

Milk—Nine pints (same as 9 pounds) = 3,000 C.

Bread and milk—Two loaves bread and 2 pints milk (4 pounds) = 3,276 C.

The milk-alone diet weighs about 9 pounds, the bread and milk about 4 pounds, and yet the latter reaches a higher Calorie value and does not encumber the tissues with an overplus of the crystalline products of nitrogenous metamorphoses.

Effects of Heat.—When milk is boiled a tough skin forms upon it; this consists of a coagulable albumin that exists in milk in small quantity (one-seventh of total protein), called lactalbumin, of lime salts and a little of the casein. At the same time the milk acquires a peculiar taste and loses some of its nutritive value, which, to a certain extent, makes it inadequate for the needs of infants. The

application of heat, then, changes its taste, coagulates the lactalbumin, injures the fine emulsification of the fat and renders the casein less easy of digestion; it also probably throws the citrate of lime partially out of solution. Thus, with the view of freeing milk from harmful bacteria possibly present, the attempt has been repeatedly made to raise children upon sterilized milk, and almost always with disastrous results. Considering these facts, Hutchinson is putting it too strong when he "looks forward to the day when the drinking of raw milk will be considered as barbarous a custom as the eating of raw meat is at the present day."

CONDENSED MILKS.—There are two varieties of condensed milks on the market, one sweetened and the other unsweetened. The first contains from 15 to 17 per cent of milk sugar and 33 to 40 per cent of cane sugar. The latter, which is much the better, contains the 16 per cent of milk sugar only. Both are used largely for infant feeding, but are not to be recommended except for temporary use. Infants raised on this food may seem to thrive for a time, and often become quite fat (owing to the excess of sugar), but offer little resistance to disease and are often rachitic.

BUTTERMILK.—This is practically the same in composition as skim milk. It contains all the protein and all the carbohydrate, and is lacking only in the fat, which has been removed by churning. It offers a very cheap and should be a very useful source of protein, but is usually devoted in this country to the fattening of pigs. The sourness is due to the presence of lactic acid, which is present in small amount, usually less than 1 per cent. It is an excellent diuretic and causes a free flow of

urine; eight ounces of buttermilk drank just before retiring will, for a time at least, cause an increase of considerably more than its own volume in the twenty-four hours' urine, without any other change in the habits. After the small amount of lactic acid is removed by digestion, the calcium, potassium and sodium salts that it contains equally with fresh milk should render it an excellent solvent for uric acid, and thus a purifier of the tissues. The free use of buttermilk has lately been advocated by good authority as a great prolonger of life. Although one would not suspect it, it not infrequently seems to inhibit fermentation in cases of gastric catarrh.

The Milk Cure.—Among the many diet cures that have been advanced of late years is the milk cure. It consists of a course of from three to six weeks of an exclusive milk diet. It was recommended centuries ago for gout and some other diseases of a chronic nature. The milk should be skimmed, should be quite fresh, not cooked in any way and slowly consumed, so that, although there can be no chewing, yet there should be insalivation. The directions usually given are that six ounces should be sipped every three or four hours of the sixteen waking hours, for a few days, and then the quantity increased to eight, and finally to a larger quantity, until five or six pints are consumed in each twenty-four hours. The results are some drowsiness, slight pallor, a furred tongue, constipation and a free flow of pale, slightly greenish urine.

There is hardly a fanciful idea under the heavens that has not been tried and recommended as a cure-all, at some time in the history of the world. The milk cure is not a cure for anything that absti-

nence from all food will not cure many times quicker. Abstinence from all food except water will do everything that the milk cure can do, and will do it much more quickly, without a furred tongue, drowsiness or any of the other unpleasant symptoms that arise from an exclusive diet of skimmed milk.

Eggs.

Next to milk, eggs are the most wonderful food-stuff in the world. Just as milk contains every variety of nutritive constituent for the newly born animal necessary to augment its size to treble, with the due proportion of all its numberless tissues, so an egg contains histogenetic elements in such a complete form that within its two ounces of smooth homogeneous slime lies the possibility of a new life. It is a concrete miracle, but because of its everyday occurrence it fails to raise our admiration. Out of the amorphous, structureless jelly, without extraneous addition, the chick, organized from marrow to cuticle—muscle, feathers, bones, blood and vessels—springs into life and separate existence. It is not food for the chick; it is the chick. The absence of carbohydrates is noticeable, and goes far to confirm their close relation to muscular motion.

The average weight of a hen's egg is two ounces, about 11 per cent of which is shell, 57 per cent white and 32 per cent yolk. It is not so perfect a food as milk, for it lacks entirely that important source of energy, carbohydrate; this is because this principle is the chief source of muscular movements, and within the narrow confines of the shell there is practically no movement.

The shell is composed chiefly of lime carbonate and is not nutritive.

The white is a solution of pure albumin, the purest in nature. It consists of 85 to 88 per cent of water, 12 per cent protein, with scarcely any fat or minerals. It is practically a saturated solution of albumin. The small amount of mineral matter is potassium and sodium in combination with sulphur, chlorine and carbonic acid as sulphates, chlorides and carbonates. There is no sulphate and little chlorides in the yolk, but much phosphorus and lime.

The yolk is very complex in composition; from it the nervous system of the chick is developed. It contains 15 or 16 per cent of protein, 32 or 33 per cent of fat in the shape of a clear yellow oil. The oil consists of olein, palmitin and stearin and, owing to its fluidity and fine emulsification, is one of the most digestible forms of fat. It has been used with success in the nourishment of infants. A part of this fat is in the form of lecithin, a viscid, phosphorized oil, also containing nitrogen. This peculiar and priceless substance exists only in very small quantity in cereals and legumes, in brain tissue and nerve substance. Nuclein is also present, and mineral matter, including the salts of iron, in much larger proportion than in the white. The element phosphorus found in the lecithin and in the nuclein amounts to 1 per cent of the entire interior of the egg. Cerebrin, one of the constituents of the human brain, of unknown function and nutritive value, is present in the yolk; it contains nitrogen, but no phosphorus. The peculiar value of the yolk of egg is the large amount of phosphorus and iron it contains in organic combination, and hence in an

easily absorbable form. Seven egg yolks daily would supply all the iron required by a man of average weight.

One egg yields about 75 Calories of energy; eight eggs are about equal in nutritive value to one pound of steak. The white is a builder and restorer of tissue after muscular labor. The yolk is far more valuable; this is owing to its great richness in iron, lime and phosphorus. It is a food of special value to chlorotic girls and to anemic persons in general. The yolk comes as near to a special nerve and brain food as any that exists. The whole egg, that is the white and the yolk, is an ideal restorative for cases of anemia due to suppuration, such as pulmonary tuberculosis. Combined with starchy food, such as rice, potato or white bread, eggs form a complete food.

MEAT.

The consumption of meat per capita has been gradually increasing in the United States for many years, until now this is the largest meat-consuming country in the world.

The value of meat as food depends upon its protein, fat and salts. The important food principle, carbohydrate, is entirely lacking in its composition. The use of meat as a food is a bone of contention; those who agree on every other article of diet differ widely when it comes to meat. Extremists claim it is a poisonous food, high in price, deleterious to health and morals, productive of gout, rheumatism and cancer. To show that it is not necessary to the highest vigor, they point to the rice-eating Japanese and how they recently shamed the meat-eating Russians in efficiency, endurance and courage.

Those who take the opposite view show its nutritious constituents, its digestibility, its complete absorption and the enterprise and activity of meat-eating nations. They point out that the Japanese consume a large proportion of fish to balance their rice, which explains their remarkable endurance.

So far as physiological argument goes, it seems that the vegetarians have the best of it. All the protein, fat, salts and carbohydrates that the body needs may be derived from the products of the vegetable kingdom. It is true that, if the old dietary standards are followed, a greater bulk of vegetable food must be eaten to furnish the required amount of protein, but if the latest and undoubtedly correct standards are followed, this objection will be in large part removed.

This book is not an advocate of vegetarianism, but it is an advocate of the principle that we should derive our muscular force and bodily heat rather from carbohydrates than from protein, and this involves a reduction in the amount of meat, though not abstinence from it.

The bone, gristle, tendon and inedible portion of meat amounts on an average to 15 per cent. The analysis of the edible portion gives the following results:

	Water.	Protein.	Fat.	Carbo-hydrate.	Ash.	Fuel Value Per Pound.
Sirloin (lean)	70.8	24.6	3.7	0.00	1.3	615
Sirloin (fat)..	54.7	17.5	27.6	0.00	.9	1490
Chuck Ribs (medium fat)	62.7	18.5	18.	0.00	1.	1105
Round.....	65.5	20.3	13.	0.00	1.	950

The protein of meat is of such a nature that it is easily broken down by the digestive fluids, with the rapid liberation of heat and energy. On account of this, and probably also because the products of its breaking down act as stimulants to the cells, it produces a feeling of well-being and capability. Its stimulating effect is most strikingly noticed in those unaccustomed to its use, when it produces a state of nervous erythrism almost amounting to intoxication. These qualities make it the most effective food for short, sharp, severe exertion, and justify its use in training for athletic events, although not to the extent used by many trainers. Excessive meat consumption is the most common cause of athletes becoming "stale;" that is, it takes a man to the acme of his capacity for severe exertion, but cannot hold him there for more than a brief period. It is part of the trainer's art to lead up to this "feather-edge" condition, so that it will coincide with the day of the fight or race. Such training is done at the expense of the future health. The objection to eating meat to such an extent that the most of one's energy is derived from it, is that a certain part of its nitrogenous constituents, being hard and crystalline, are difficult to eliminate. They may slowly accumulate in the system, causing nodes and deposits, or they may fall out of solution, causing an acute attack of gout, or they may be eliminated, gradually producing damage to the delicate structure of the kidneys, causing Bright's disease. The purin bodies, xanthin, sarcin, adenin and uric acid, are contained in the flesh and glands of animals, and when introduced into the body as flesh foods are mostly oxidized to and eliminated as uric acid, a hard, gritty, insoluble crystalline acid.

The solution of this in the fluids of the body is greatly favored by their alkaline reaction. Meat eating not only introduces them but, by reducing the alkalinity of the blood, throws out of solution those previously introduced and accumulated.

The question of training for athletic events is not settled yet. Practical trainers, looking to the preparation for a single great exertion, such as a prize fight, are in favor of meat, but they may be in error even for that purpose; indeed, the most reliable experiments that have been made—those at the Yale University—rather point the other way. It is certain that the amounts of protein consumed by Americans, in the form of meat, is very far in excess of what nature requires for the repair of waste. Of the various meats, beef is the easiest of digestion, pork the least so. Immature meats, like veal and lamb, are less digestible than beef. There is only about 5 per cent unabsorbed, so that a meat diet leaves a very small residue for the intestine to handle.

Fish.

Fish, like meat, furnish protein and fat, but no carbohydrate. As a rule, fish are more easy of digestion than meat, and are equally well absorbed. Two special qualities have been attributed to fish. One is that they are an especial food for the brain, and the other that a fish diet possesses aphrodisiac properties. The first idea was formulated theoretically by Agassiz upon an erroneous analysis. The second was maintained by Brillat-Savarin, one of the greatest epicures that ever lived.

Experience of several observers seems to show that a meal of fish does increase the animal pro-

pensities, and this is especially true of caviar, the roe of the Russian sturgeon, a fact which one may bear in mind in cases of sexual weakness. In countries near the sea, fish generally form the cheapest source of protein in existence.

The constituents of some of the important food fish in the fresh state is shown in the following table:

	Water.	Protein.	Fat.	Carbohydrate	Ash.	Fuel Value Per Pound.
Cod Fish	82.	16.5	.4	0.00	1.2	325
Salmon..... (entrails removed)	48.1	13.8	8.1	0.00	.8	600
Mackerel.....	40.4	10.2	4.2	0.00	.7	365

Oysters.

Oysters are one of the most popular of sea foods, especially in the United States. They share with milk the distinction of containing all the nutritive principles, though fat is only slightly represented. They may be said to be water slightly gelatinized by organic matter. They contain the following proportions of food constituents:

	Water.	Protein.	Fat.	Carbohydrate.	Ash.	Fuel Value Per Pound.
Oysters (without shells).	88.3	6.	1.3	3.3	1.1	230

They possess the advantage of being easily digested. The irregular, blackish portion in the belly of the oyster is the liver, and is almost self-

digesting when broken up and mixed with the other tissues. Being merely a soft, gelatinous mass of organic matter, oysters are peculiarly liable to decomposition, with the occasional production of poisonous ptomains. The green discoloration which sometimes excites the suspicion of householders is not so bad as it looks, being caused by harmless green algæ.

Vegetable Food.

The vegetable kingdom furnishes all the elements of food in cheaper form than meat and without the undesirable excess of protein. The predominant feature of vegetables is the large proportion of carbohydrates, a feature which offers a striking difference to animal flesh, which contains practically no carbohydrate.

Vegetable foods are digested more largely in the intestines than meat. They are more bulky and, as a rule, less completely absorbed. It is a strong point in their favor that the various food constituents are all represented in them, and in many vegetables in a well-balanced proportion.

In regard to the protein of vegetables, it has been found that the larger the per cent of it the more perfectly it is absorbed, and *vice versa*. Experience and analogy show that endurance for steady, long continued effort is best furnished by vegetable food, while meat better supplies the power for a short but intense effort. Compare the restless, nervous, irritable activity of the meat-eating tiger with the sluggish movements of the mild-eyed granivorous cow, and you will see an embodied type of the two diets.

Cereals.

Cereal grains form the basis of bread, and bread is the basis of human nutrition, the real staff of life. The importance of cereals rests in the fact that they and their preparations furnish the chief food constituents, protein, carbohydrates, fat and minerals, cheaply, abundantly and in an agreeable form. These qualities, together with their complete absorption, place them in the front rank of human foods.

In some cereals, such as rice and Indian corn, carbohydrate predominates, making them prominent energy producers. In others, such as oats and Indian corn, the considerable quantity of fat present makes them powerful heat producers. In all cereals the useful though variable proportion of protein enables them to furnish the elements necessary for the repair of tissue waste.

Wheat is a representative and the most important of the class. The glutinosity of its protein peculiarly adapts it to the making of light, porous bread, and the well-balanced proportion of its constituents makes it a nearly complete food. Barley is one of the most ancient of human foods. It was highly esteemed by the athletes of ancient Greece. The amount of moisture in cereals varies but slightly and averages about 11 per cent. The general composition of cereals may be summed up as follows:

Water	11	per cent
Protein	11	" "
Carbohydrates	69	" "
Fat	2.5	" " (½ to 8 per cent)
Minerals	2	" "

The averages of a vast number of analyses of different cereals made by the United States Department of Agriculture is as follows:

	Wheat.	Oats.	Indian Corn.	Barley.	Buck-wheat.	Rye.	Polished Rice.	Unpolished Rice.
Water.....	10.60	10.	10.75	10.85	12.	10.50	12.40	12.00
Protein.....	12.25	12.	10.	11.	10.75	12.25	7.50	8.00
Fat.....	1.75	4.50	4.25	2.25	2.	1.50	0.40	2.00
Cellulose (Indigestible).	2.40	12.	1.75	3.85	10.75	2.10	0.40	1.00
Carbohydrate.....	71.25	58.	71.75	69.45	62.75	71.75	78.80	76.00
Ash.....	1.75	3.50	1.50	2.50	1.75	1.90	0.50	1.00
Calorie value per pound..	1675.	1850.	1730.	1640.	1660.	1630.	1630.	1630.

Averages are useful, but the reader should be careful not to apply them too rigidly to any particular sample. The protein of wheat, for instance, may run as high as 17.15 per cent, as in one sample grown in Nebraska, or fall as low as 8.58 per cent. as in one sample from Oregon, although these are unusual extremes. The fat of Indian corn may, in a particular sample, reach almost 8 per cent. It may be stated in general that the cereals of the United States are the freest from moisture of any in the world.

Flour and Meals.—Before using cereals for food, they are ground to a powder. When reduced to an impalpably fine powder the product is called flour, while the term meal is usually applied to the coarser products.

The result of grinding is that certain desirable portions of the grain are lost, in company with some impurities that it is well to lose. A little over one-

half of the mineral matter is lost, and as these elements (especially the lime, potash and phosphorus) play an important role in the growth of tissue, it is better for children to eat bread made from the coarser flour than from the pure white, highly refined flour.

The large financial interests involved in the production of wheat-flour, have resulted in more refinements in the process during twenty-five years than ten centuries of purely scientific interest would have produced. Twenty-five years ago the wheat was simply crushed between stones and separated by bolting or sifting into three products, *i. e.*, bran, flour and middlings. All the impurities were contained in these three grades. At the present time eighty-eight separate products are obtained by successive purifications, screenings and separations and the various qualities of commercial flour produced by judicious blending of these products.

The three scant pages in which the United States Department of Agriculture, under the direction of H. W. Wiley, has recorded the results of the analysis of each of these eighty-eight products are probably the most laborious pages of literature in the world.

It has been shown that a little more than 258 pounds of a good quality of winter wheat yield one barrel of flour, 57.82 per cent of which is patent flour; 11.28 per cent is the so-called bakers' flour, and 6.77 per cent is low-grade flour.

The patent flour is the high grade; the two others in various mixtures or blends are sold under the names of Family, Bakers' or Red Dog flours. Beside the above there are 25 per cent of bran, shorts and waste.

Bread.

Bread made from high-grade patent flour is the best for those engaged in outdoor labor. Graham, whole-wheat and the coarser breads are better for those engaged in sedentary mental occupations. The first is more completely absorbed, and the high content of carbohydrate makes it a good food for the muscles. The constipating tendency of the small intestinal residue is overcome by the active life. There is enough nitrogen in the patent flour, aided by an occasional egg or small piece of steak or cheese, to supply protein abundantly to make up the tissue waste.

The greater residue of the coarse bread tends to prevent the constipation of sedentary workers. These are also better for growing children. There is a wonderful amount of strength in bread for labor. The abstemious laborers of Spain maintain in their lean bodies a high degree of endurance and vigor upon bread, often very stale, and a little dry cheese made from goats' milk and water. A frugal diet that would excite the scorn of the better fed American.

Especial care should be taken to see that bread is good in quality for it is in many poor families the largest part of the diet and the main food of the children. These flours show a higher proportion of protein, ash, fat and fiber, although the color of the bread is darkish and the gluten character not adapted to making a very light bread.

This is also the best bread for sedentary individuals who use their brains a good deal. The slightly increased amount of phosphorus serves as a stimulant to the internal processes, and the larger

insoluble residue serves to increase the peristaltic movements of the bowels and thus obviate, in a measure, the constipating effect of lack of exercise. The term low grade, when applied to flour, does not mean poor flour or one of an essentially inferior quality. It is a trade name for a dark family flour making a cheap, sweet, palatable and nutritious loaf, inferior to patent flour bread in the single quality of whiteness.

Two-thirds of the bulk of fermented bread is gas; of the solid residue about 40 per cent is water. A little more than 50 per cent is carbohydrate and there should be from 7 to 8 per cent of protein, leaving 2 per cent evenly divided between fat and minerals.

This shows bread to be one of the least watery of vegetable foods. Home-made bread is a very variable product, owing to the reluctance of the American house-wife, to use scales and measures. From an economical standpoint, it is much cheaper than bakers' bread but it may be better or worse in quality according to the skill of the housekeeper. Allowing for the higher prices paid for smaller quantities, five pounds of the best patent flour will make about seven and one-half pounds of excellent bread at a cost of 23 cents, as the following formula shows:

5 pounds Flour	.18
405 grains Yeast	.02
40 fl. ozs. Water	—
180 grains Salt 480 grains Butter	.02
Fuel (Gasoline)	.01
	.23

If the flour is bought by the large bag or barrel, the cost would be reduced from 23 to 18 cents. The same amount of bakers' bread would cost 38 to 50 cents, according to whether pound loaves or 12-ounce loaves were sold. The latter weight is now legal in Chicago.

Salt-Rising Bread is very much preferred by many palates, but is rather more difficult to make successfully. Many of the failures are due to the fact that the modern patent flours contain little or none of the natural ferments of the grain, as did the flour that our mothers used. To overcome this difficulty, either the so-called low-grade flour must be used, or else a little whole wheat flour or corn meal must be used to start the fermentation. We have found the following process, recommended by the United States Department of Agriculture in Part Ninth of Bulletin 13, to make a very delicious bread.

One-quarter pint of milk is slowly heated to near the boiling point, but not allowed to boil. This sterilizes it and prevents premature or undue sourness in the yeast. When the temperature falls to blood heat, enough Indian corn is mixed in to make a batter. The vessel is wrapped with several thicknesses of paper and set in a warm place for about six hours. The mixture should now look lively with bubbles and have a peculiar odor, which one soon learns to recognize.

This is the ferment: now stir a teaspoonful of salt into one pint of warm water (100° F.) and enough of patent flour to make a stiff batter, add the corn mixture and allow the whole to stand in a warm place for an hour or more. This is the salt rising; this is mixed with enough of warm patent

flour dough to make six loaves, well kneaded, moulded into six loaves, and set in a warm place until each pan is full and baked. The taste, once gratified by this bread, is seldom satisfied with any other. To succeed, it is absolutely essential that a uniform heat be maintained from the first step to the last.

INDIAN CORN.—In all parts of the United States, corn forms a considerable proportion of the food of the people. In the South, it makes the only form of bread ever tasted by thousands.

Of the important cereals, it is the weakest in protein, but among the strongest in carbohydrate and fat. The amount of silica in its ash is remarkably small. In Calorie-value it is superior to wheat and better adapted to the winter season, though owing to its lower protein and mineral content, is not so well adapted to growing children as wheat.

BARLEY.—One of the most ancient of human foods, highly prized by the athletes of Greece. It is not used in the United States to any great extent as a cereal food for man, though often found as an ingredient in soups. Of all the cereals, it has the highest malting power and hence is largely used in the brewing of malt liquors. The few barley flours in the market have been found to be very starchy and low in protein, fat and ash. This is owing to the rejection of the germ and outer envelope in the process of milling. On this account infant foods made from decorticated barley are apt to make fat babies with flabby tissues and are not to be commended. Preparations of the whole grain make an excellent, complete food. The refuse from brewing, if properly dried and preserved, forms

a valuable cattle food, notwithstanding the widespread prejudices to the contrary.

Buckwheat is one of the weakest foods of this class, although the highest in price. In the form of pancakes it constitutes a favorite American breakfast. The flour is remarkable for the large per cent of indigestible cellulose which it contains; this is also responsible for its characteristic dark color.

Owing to its relative high price, buckwheat is the most extensively adulterated of all flours. Any white flour may be given the necessary dark color by the admixture of a little rye and the detection of such adulteration is extremely difficult by any chemical or microscopic test, although not beyond the reach of a cultivated palate. The syrup eaten on buckwheat cakes and the sausage generally eaten with it, increase both the protein and carbohydrates to such an extent, that so eaten it makes a complete food. It is better for constipated and sedentary people than fine, white bread and hence makes a more nutritious breakfast than the usual coffee and roll of American restaurants. Owing probably to the large proportion of crude fiber, buckwheat frequently causes an itching rash.

Oats is one of the strongest of grains, ranking high in protein, highest in fat and minerals, but lowest in digestible carbohydrate. Like buckwheat, it contains much crude fiber and sometimes irritates sensitive skins; it is also the most prone of all cereals to produce sour stomach. The proportion of its constituents make it a strong tissue builder and hence an excellent cereal food for children and for the repair of tissue waste in adults; its one objection (which is common to all cereals) is that being prepared as a pultaceous mass, it offers noth-

ing for the teeth to act upon and hence is a strong provocative to hasty swallowing. Its protein is not tenacious, like that of wheat and hence it is incapable of producing a light, porous or vesiculated bread. The unleavened oat cake contains twice as much tissue reconstructive and heating material as fine, light, white bread. Pigs fattened on oats, while apparently sound and well-grown, furnish a rather bitter and wiry pork, very different from corn-fed or barley-fed pigs, a difference for which there seems to be no good reason in the chemical constituents.

Rye. The analyses of rye show it worthy of the high place among foods given to it by the German race. It ranks next to wheat in protein and equals Indian corn in carbohydrate, but these good qualities are more reduced by milling than is the case with wheat. Its protein lacks some of the tenacity of wheat gluten, although it greatly exceeds that of oats; rye bread is therefore apt to be heavy and sour. It has a large use in the manufacture of rye whisky. An objection to rye as a common food, is its liability to be contaminated with the poisonous ergot. Pellagra, the leprosy of the Alps, once common in northern Italy, is the result of eating rye bread contaminated with ergot. Rye is weaker in phosphoric acid than wheat.

Rice.—In this cereal, starchy matters predominate, with a corresponding weakness in protein, ash and fat. The granule of the rice starch is a very minute one and hence easily digested. Rice is distinguished by complete absorption, leaving a very small residue in the bowel. It is capable of sustaining the system well under the strain of severe muscular labor and out door life, but is ill adapted

to those who follow sedentary occupations. The very large silicious ash of rice is probably due to the grains being cleaned and polished with quartz or some silicious stones.

Peas, Beans, Lentils.

The characteristic of these leguminous foods is richness in protein. When the nutritive value is compared with the price, they are undoubtedly the cheapest of all foods, and on this account, may be called the "poor man's beef." Something less than two pounds of dry peas in 24 hours would satisfy all the demands of nutrition, but after a few days the palate would doubtless demand some break in the monotony. The composition of the three chief legumes are shown in the following table: The analyses were made in their ordinary dried state:

	Water.	Protein.	Fat.	Carbo-hydrate.	Ash.	Calories in a Pound.
Peas	10.	24.	1.	62.	3.	1655
Lentils....	8.	25.7	1.	59.	5.8	1620
Beans.....	12.6	22 5	1.8	59.	3.	1605

This shows the high rank of these excellent and economical foods. Lentils are among the most highly nitrogenous of foods. A Hindoo proverb says: "Rice is good but lentils are my life." Their ash is large and rich in potash, phosphorus and iron. They contain less sulphur than either beans or peas and hence are the least inclined of the three to cause flatulency. Beans contain the most sul-

phur and are the most flatulent. The protein of vegetables is the most difficult of their constituents to absorb and in this respect lentils again rank the highest. About 10 per cent of the protein of lentils is wasted, while peas lose from 10 to 15 per cent and beans 25 or 30. It is to be hoped that the above considerations will gradually bring lentils into more general use as a nutritious and economical article of daily food.

Potatoes.

This is one of our standard vegetables, chiefly valuable on account of its carbohydrate; the amount of fat is inconsiderable, about 1 per cent. Protein is also very weakly represented. It is therefore, not a complete or well-balanced food, like wheat or lentils, but they form a cheap and agreeable dish, supplying carbohydrate abundantly, as a balance to the meat that is usually eaten with them. If one were to depend upon potatoes alone for food, it would require a very large amount, something over 22 pounds, to supply the 120 grams (four ounces) of protein demanded by the standard dietaries of Voit and Atwater. These standards are undoubtedly too high as has been already pointed out, and if any one was so situated as to be restricted to a potato diet, we would advise a no larger consumption than four pounds. This would avoid the immense over-supply of carbohydrate which 22 pounds would involve, and would undoubtedly maintain the physical strength for a long time. The most economical method of cooking potatoes is to boil them in their skins. Boiled potatoes contain 75 per cent water, 2.5 protein, .1 fat, 20. carbohydrate, 1. ash, and have a fuel value

of 440 Calories to the pound. If potatoes are peeled, put into cold water and gradually brought to a boil, the loss of nutrient is considerable. One bushel boiled in this way would lose an amount of nutritious matter, equivalent to one pound of lean steak.

Potatoes contain a small amount of potassium citrate which adds to their antiscorbutic qualities. (See Note V.)

Turnips.

Turnip is a vegetable of weak nutrient power, but one for which many people have a decided liking. The proportion of water, as is the case with many vegetables is surprisingly large. Turnips, cabbage, tomato, spinach and many other such foods, although firm, solid, bodies contain more water than milk, which is a mobile liquid.

It will probably be a surprise to most people to learn that turnip contains neither starch nor sugar. The 8 per cent of carbohydrate present is in the form of pectose. There is 89. per cent water 1.3 per cent protein and .8 per cent minerals. Fuel value of one pound is 185 Calories.

The flavor of turnips is peculiar and highly esteemed by many people. As they contain little that would add sugar to the urine, they form a valuable food for diabetics, to a certain extent taking the place of potatoes.

Cabbage.

Cabbage is a favorite vegetable with many people, especially those of the German race. It contains over 90 per cent water, about 2. of protein, .3 of fat, 6. of carbohydrate and 1.5 of ash, fuel value of

a pound is 145 Calories. Sliced, raw and fortified with egg and vinegar dressing, is the most nutritious and digestible form in which cabbage can be eaten, for boiling not only removes a considerable proportion of its already small percentage of nutrients but also greatly prolongs the time required for digestion. The fermented preparation known as Sauerkraut is slightly less nutritious, its fuel value equalling 125 Calories per pound.

Tomatoes.

Tomato is another favorite food in America, though little used in the old country. Though known as an ornamental plant for centuries, it has been used as a food for only about sixty years; at the present time it is one of the most highly prized articles of food; millions of cans of the preserved fruit are eaten annually. It contains 94 per cent water, 1. of protein, .5 of fat, 4. of carbohydrate and .5 of ash. The fuel value of a pound is only 105 Calories. The acidity is due to citric acid, the acid of lemons and oranges. Cucumbers, carrots, spinach, belong to the same class. The latter is particularly rich in iron, and with radishes and asparagus contain a considerable amount of lime. They are valuable, notwithstanding the small amounts of nutrients in them, on account of their antiscorbutic and laxative properties; the relatively large per cent of minerals and free acid which they contain, makes them particularly grateful in hot weather, when acid perspiration is free.

Onions.

The peculiar, strong flavor of onions, produces both friends and enemies. Many are extremely fond of them, and many more are unable to eat any dish containing them. In addition to the usual constituents of green vegetables, they contain a volatile, organic sulphur compound, to which they owe their odor and taste.

They have a somewhat soothing effect, and when taken at dinner, generally conduce to an after-dinner nap.

They also possess laxative properties upon many people. They impart a peculiar odor to the excretions, and increase the volume of urine. Eaten raw they frequently ameliorate and occasionally cut short an oncoming attack of coryza. (Note VI.)

Fruits.

Judged strictly from a chemical standpoint, fruits would be of little importance as food, owing to their low content of protein and fat. But judged from the delight which they afford the palate, from the eagerness with which the unspoiled appetite of children welcome them and the benefit which the encumbered system of heavy eaters derive from them, they would seem the most important of human foods. In truth, fruits are not to be judged so much by their chemical constituents as by the evidence of mankind in their favor. They contain from 85 to 92 per cent of water, protein .3 to 1.5, fat .1 to 3., carbohydrate 2 to 15., ash .2 to 1., free acid .5 to 7. They diminish the alkalescence of the blood and the acidity of the urine and possess useful laxative and antiscorbutic properties.

Notwithstanding the small amount of nutrients in this class of food there are people who live exclusively upon fruits and nuts, thus combining the most dilute and the most concentrated of foods. Some investigations as to the result of an exclusive fruit and nut diet were made by Jaffa of the University of California. The subjects were a family of two women and three children who had subsisted for from five to seven years upon fruits and nuts alone. It was their habit to eat two meals a day, one at 10:30 a. m., consisting of nuts and fruits. The second at 5 p. m., consisting of fruit, olive oil and honey. The only food used besides fruits and nuts was olive oil, honey, celery and a small amount of prepared cereal.

The first subject was a woman 33 years of age, five feet in height, weight 90 pounds. Experiments lasted 20 days. The results were:

Cost Per Day.	Protein.	Fat.	Carbo-hydrate.	Crude Fiber.	Calories.
23.7 cts.	33 (1 oz.)	59. (2 ozs.)	110 (3½ ozs.)	40 (1⅓ ozs.)	1200

The standard dietaries for a woman at light labor calls for 90 (three ounces) protein and 2,500 Calories.

The second subject was a woman 30 years old, 104 pounds. Experiments lasted 25 days. The results were:

Cost Per Day.	Protein.	Fat.	Carbo-hydrate.	Crude Fiber.	Calories.
17.2 cts.	25 (⅞ oz.)	57	72.	27	1.040

This small amount of food seemed sufficient for her needs.

The third subject, a girl of 13, weighing 75½ pounds consumed

Cost.	Protein.	Fat.	Carbo-hydrate.	Crude Fiber.	Calories.
19. cts.	26.	52.	111.	46.	1235

Standard dietaries call for a child of 13, 90. (three ounces) protein and 2,450 Calories. She had the appearance of a well-fed child in excellent health and spirits.

The brother of the last subject gave about the same results, but gained two pounds weight in 22 days.

The fifth subject was a girl of six, weighing 30½ pounds. She had been very delicate as a baby and did not begin to thrive until a decoction of figs was added to the milk eaten. She had never eaten anything outside of fruits and nuts, except olive oil, honey and a small quantity of green vegetables. She frequently craved lettuce. She was 10 pounds under the average weight and seven inches less than the average height. Her father was a small man and her mother and grandmother much below the average height and weight. (See Note VII.) During the study of 25 days she gained 2½ pounds.

Her diet contained much less protein than the standard dietaries require for a child of one to two years, yet she seemed perfectly well and was exceedingly active.

If these results are compared with those obtained by Chittenden, instead of the old and erroneous Voit standard, they become much less striking and sim-

ply confirm the opinion that Chittenden is nearer right than Voit.

The two adults experimented upon above had lived upon this diet for seven years and they claimed to be in better health and capable of more work than they ever were before. The three children had the appearance of health and strength, they ran, jumped and played all day, though below the average in height and weight. When it is considered that the limited means of the family prevented them from eating as much as they would like to have, and that they gained in weight during the tests when given as much of their peculiar food as they wanted, it seems that their undersize was due to lack of food rather than to its character.

They were unusually free from colds and other complaints of children. The analyses of the feces and urine in one of these subjects showed that there was very complete absorption and that notwithstanding the fall of the protein below the usual standards, there was a daily gain of 13.7 grams (nearly ½ ounce) in body weight.

Fruits are relatively rich in minerals. The following list shows the average results of several analyses. The total ash contained the following proportions of the important elements:

	Potassium.	Sodium.	Calcium.	Magnesium.	Iron.
Prunes...	63.	2.6	4.6	5.	2.7
Apricots .	59.	10.0	3.	3.	1.6
Oranges..	48.	2.5	22.	5.	.97
Lemons..	48.	1.7	29.	4.	.43
Apples...	35.	26.	4.	9.	1.4
Pears....	54.	8.	7.	5.	1.
Peaches..	27.	.2	8.	17.	.55

The total ash of fruits ranges from 1 per cent in cherries to .2 per cent in apples, cranberries and huckleberries. The above refers to the constituents of this ash. These minerals are in combination with organic acids, and as a rule there is more than enough of the latter to neutralize the bases, so that the overplus, present as free acid, gives rise to the agreeable tartness so much esteemed in fruit. The free acid ranges from .1 per cent in pears to 7 per cent in lemons.

GRAPES.—On account of their importance as the source of wine and because the "Grape Cure" is still somewhat in vogue, this fruit deserves brief mention. Their composition from an average of five analyses is as follows:

Water.	Protein.	Fat	Carbo-hydrate.	Ash.	Calories Per Pound.
77.4	1.3	1.6	19.2	.5	450.

The grape cure is properly an exclusive diet of grapes, although it is often marred by the addition of other foods. The patient should do his own picking in the open air; the skins, pulp and seed should all be eaten and thorough insalivation should be secured by careful mastication. The absurd rule of eating eight pounds in 24 hours usually given should be disregarded; if eaten slowly according to one's appetite, probably four pounds would never be exceeded. The result is excellent in heavy eaters with abdominal plethora and too much adipose. A laxative and diuretic effect is noticed and none of the disagreeable symptoms noticed under the milk cure occur. Grape juice unfermented is an agree-

able, sub-acid beverage, containing some nourishment. It is very prone to fermentation and on this account often disagrees with weak digestions.

Nuts.

Nuts are among the most concentrated of foods, thus presenting a strong contrast to the water-containing fruits. Their richness in oil, carbohydrates and protein makes them extremely nutritious, but the very concentrated form in which they occur, also renders them hard to digest.

The Calorie value runs high; almonds, cocoanuts and walnuts run up to plus 3,000 and peanuts over 2,500.

The composition of some of the principal nuts is shown in the following:

	Shells.	Water.	Protein.	Fat.	Carbohydrate	Ash.	Calories Per Pound.
Peanuts ..	24.	9.	25.8	38.6	24.4	2.	2.560
Chestnuts	16.	45.	6.2	5.4	42.	1 3	1.125
Cocoanuts	37.	3.5	6.3	57.4	31.5	1.3	3.125
California Walnuts..		2.5	27.6	56 3	11.7	1.9	3.105
Filberts..	52.	3.7	15.6	65.	13.	2.4	3.296
Almonds..	45.	4 8	21.	54.9	17.3	2.	3.030

The investigations of Jaffa, mentioned above, show that by means of nuts, in combination with fruits and a few simple vegetable productions, health and contentment may be maintained, without the use of cookery at all. These facts should commend themselves to those who are thinking of the simple life.

Coffee, Tea and Cocoa.

It is not the nutritive value of these beverages that makes them so important, but rather their peculiar exhilarating and restorative effects, which are so striking, that they may be regarded as quasi-medicinal as well as dietetic. Coffee, tea and cocoa all owe their peculiar virtues to alkaloids; in the two former, the effect is striking, but in the latter, it is masked by the heavy nutritious fat and carbohydrate which cocoa contains. The three alkaloids, caffeine, theine and theobromine, belonging to the three beverages respectively, have a certain relation to each other and to the purin bodies.

The purin bodies are nitrogenous compounds found in small quantities in almost all the tissues of the body. They are grouped around a hypothetical body called purin, which serves, so to speak, as a core for the others. Purin is $C_5N_4H_4$. Uric acid is the most highly oxidized member of the series. The relation is here shown:

Uric acid.....$C_5\ N_4\ H_4\ O_3$
Xanthin .....$C_5\ N_4\ H_4\ O_2$
Hypoxanthin or Sarcin....$C_5\ N_4\ H_4\ O$

These exist in all flesh foods: caffeine and theine, identical with each other, are tri-methyl-xanthine, that is, xanthine with three of its four hydrogen atoms cast out and replaced by methyl (CH_3).

Theobromine is di-methyl-xanthine, that is, xanthine with two of its four hydrogen atoms cast out and replaced by methyl (CH_3).

These beverages, therefore, belong to the uric

acid-producing foods and should be used with judgment and not abused.

Coffee is a pure mental stimulant; it enables one to use all one's mental powers to the greatest advantage and is therefore of especial use to lecturers, orators, writers and brain workers in general. Tea is a most potent restorative after physical fatigue or combined muscle and nerve exhaustion. Both are of most use to the aged, because they retard the waste of tissue, which is sure to occur in the declining years of life.

Among the disadvantages are a slight retarding effect upon peptic digestion and a tendency to sleeplessness. Idiosyncracy plays an important role in tea and coffee drinking. They agree with some and not with others without any rational explanation. I have known coffee to produce decided urethral irritation in one individual. Tea in excess produces a fine tremulation of the hands.

Children should never be permitted to touch either coffee or tea, owing to the stimulating action which is deleterious to their tender and excitable nervous systems. Cocoa, on account of its richness in nutrients, makes an excellent corroborant, warm beverage for them; it is especially appropriate in cold weather after exposure.

Made in the Spanish fashion, very rich and sweet, it is apt to produce headaches, owing to the afflux of blood to the liver, necessary for its digestion. Drinking copiously of water immediately after taking chocolate will prevent this. It is more rational, however, to dilute it before rather than after drinking.

Alcohol.

The use of alcohol as a food has been a subject of heated controversy for several generations. Some have claimed that it is a valuable food; others have absolutely denied that it is a food at all, and both sides have been maintained with much acrimony. Atwater's recent experiments, made with very elaborate and accurate apparatus, show results that really favor the cause of temperance and the tenets of most temperance workers, but they have been stated in such a way as to appear unfavorable.

Atwater's conclusions may be summed up thus:

Alcohol *in small quantity* slightly increases the digestibility of protein and is without any effect upon the digestion of fat and carbohydrates. Alcohol *in small quantity* is more completely oxidized in the body than are the nutrients of ordinary food.

Alcohol protects fats and protein from oxidation by furnishing the body the needed carbon. This only applies to moderate quantities. These points may be freely admitted by temperance advocates without the slightest injury to their cause, for, as Atwater admits, the action of alcohol as a poison is so potent that in any quantity it reverses the above conclusions. He says: "Alcohol appears also to exert at times a special action as a drug. In large quantities it is positively toxic and may retard or even prevent metabolism in general and protein metabolism in particular."

As to alcohol being a source of muscular energy, he goes on to say: "Even with the small doses of these experiments there were indications that the subjects worked to slightly better advantage with

the ordinary rations than with alcohol. The results of practical tests on a large scale elsewhere coincide with those of general observation in implying that the use of any considerable quantity of alcoholic beverages as a part of the diet for muscular labor is generally of doubtful value and often positively injurious." This is saying in a very hesitating, halting way, that alcohol is injurious rather than beneficial when taken in any quantity.

In regard to mental operations, Abel summarizes the effect of alcohol about as follows:

"Alcohol produces a tendency to premature and erroneous reactions; the reactor often thinks that he is reacting more quickly than usual when he is in reality slower. It lessens the power of clear and consecutive reasoning; in many respects its action on the higher functions resembles that of fatigue of the brain."

According to these two investigators, the first of whom excited the ire of temperance advocates, there is not much to be said in favor of alcohol as a food. There is no reason to regard it of value either as a muscle food or as a heat producer. When the blood is collected or congested into the internal organs and there is danger of a chill, alcohol will quickly bring the blood to the surface and equalize the temperature.

It is therefore hardly worthy of consideration as a food; because although a limited amount does decompose in the body and yield heat and energy, like ordinary non-nitrogenous food, yet its drug action is so evident and so potent that it far overbalances the nutritive value. It expands the capillaries, it brings the blood from the internal organs

to the surface, and without adding much heat to the total stock, it makes available what heat one has. Thus the use of alcohol at the proper time and in the proper dose may stop an incipient chill, may ward off an oncoming pneumonia, or may postpone the paralyzing effect of cold for a time until shelter can be obtained. Alcohol comes to us as a beverage in various forms such as wine, distilled spirit and malt liquor.

Wines.—Wines vary in alcoholic strength from the 3 per cent of light wines to the 25 per cent of port. Whenever the alcoholic strength of any wine exceeds 13 per cent, spirit has been added to it. A naturally fermented liquor cannot contain more than that amount, for as soon as the alcoholic strength reaches 13 per cent the process of fermentation stops.

Wines are classified according to color as red or white, and according to character as generous, dry, sweet, sour, rough, light or sparkling. A generous wine is one with plenty of spirit; it is sometimes called spiritous wine—port wine, for instance. A dry wine is one in which the sugar of the juice has been completely fermented and turned into spirit and carbonic oxide. Sauterne is an example. A sweet wine is one which still contains some unfermented sugar. Tokay or Somlauer are instances. A rough wine is generally a dry wine in which a little tannin from the grapes has imparted an astringent or austere taste.

A sparkling wine is one which contains some carbonic oxide dissolved, giving it an effervescent or sparkling appearance when opened to the air.

All wines contain some free acid; when a suffi-

cient amount of free acid is present to affect the taste decidedly it is called a sour wine. Some of these qualities may be conjoined in a single wine: thus sherry is both generous and dry; claret may be both dry and rough; tokay is sweet and generous. Opposites, such as dry and sweet, however, cannot be combined in the same wine, although free acid and sugar may be conjoined as in champagne.

Light wines do not improve after two or three years no matter how long they are kept. Strong wines with plenty of spirit and some free acid improve almost indefinitely by the very gradual formation of aromatic ethers from a reaction between the spirit and the acids. These form the so-called bouquet of wines. Old wine may be worth its weight in gold in some cases of syncope after or during diphtheria, or in the asthenia of old age, or of severe exhausting disease. The minute quantity of the ethers mounts immediately to the brain and nervous system and awakens new life before the alcohol has had time to be absorbed.

Children should have no wine as a beverage; to them it should be a medicinal stimulant only. Adults in full health have seldom any need of it. It is a luxury, a gratification, an expander of the heart, to be used at feasts and in company. "Every inordinate cup is unblessed."

To the aged, a dry, sound wine is a very useful medicinal agent for the waning powers, and there can be no objection to those in the decline of life making use of it if found to agree.

Tokay and somlauer wines (they are practically the same) have a special stimulating action upon the generative powers, a feature which may find

some explanation in the large proportion of phosphorus in their ash.

Spirits or distilled liquors contain from 40 to 60 per cent of alcohol; they have little or no free acid in them. Whisky, the favorite stimulant of the Americans, is made from grains of various kinds. Irish whisky often from potatoes. Gin is practically the same as whisky in alcoholic strength and origin, but has a decided and peculiar flavor as well as a considerable diuretic action from the oil of juniperus communis. This is imparted to it either by adding juniper berries to the mash or the volatile oil of juniper to the distilled liquor. Rum is a spirit of 50 to 55 per cent strength, made from fermented molasses. Brandy, a spirit made from wine and the marc of grapes.

None of these liquors should ever be administered undiluted. Largely diluted with water, they form a valuable, neutral stimulant, but owing to the high per cent of spirit they produce the most disastrous consequences when habitually used to excess. Owing to the absence of acids, distilled liquors are less deleterious to high livers than port wine or than the sour wines of Germany.

Malt Beverages.—Malt liquors contain from 2 to 6 per cent of alcohol and have also the nutritive qualities of the soluble principles of malt. These principles are carbohydrates. The maltose and the hops or other bitters so overbalance the slight proportion of alcohol that malt beverages can hardly be called true stimulants.

All malt liquors have an acid reaction, which is due to lactic acid. There is no better formula for a miserable and painful old age than a rich nitro-

genous diet and plenty of malt liquor. If a wretched old age is not attained it is only because the malt devotee dies before old age is attained. The substitution of wine for the malt is not any better. In the one case lactic acid retards the elimination of the nitrogenous debris, in the other tartaric acid. The use of pure malt liquors in moderation is an excellent soother for an irritable heart, for nervous, distracted states of mind and for erythristic conditions in general. The qualities of the three kinds of alcoholic beverages may be summarized as follows

Distilled liquors are pure stimulants, free from acidity.

Wine is complex, nourishing, stimulating and corroborant.

Malt liquors are soothing, calming, nourishing, only slightly stimulating.

All of these are two-edged swords and capable of causing destructive degenerations, both psychical and histological, when abused by excesses.

Butter and Butterine.

Butter is the most digestible of fats, and the most delicate and delicious of them in flavor. Its per cent of fatty acids, especially the volatile fatty acids, is so large that it can thereby be distinguished from all other fats. In those subject to acute gastritis, with headache and vomiting of butyric acid-smelling vomitus, butter should be abstained from for a time. The usual cause of such attacks is overeating. Butterine is one of the wonders of art and shows how much more pecuniary interest will do in the development of a

product than science alone. With the possible exception of rice, which is scoured and polished and generally stored in bags, butterine is the cleanest and purest food in the world. It is made from the olein (oleo oil) of beef suet and neutral lard. The latter is made from the layers of fat of the pig, frozen immediately after removal, to quickly eradicate the animal heat, which is provocative of incipient decomposition and the cause of lard odors. It is then melted by steam coils in huge vats and some shovelfuls of pure salt skillfully scattered over it. Salt is entirely insoluble in fat, but the particles descending carry with it all shreds and particles of membrane, tissue and blood, leaving it clear. This is then pumped or syphoned off through fine sieves, and forms the product known as neutral lard.

Oleo oil and neutral lard, with a small admixture of fresh grass butter, constitutes butterine, a clean, wholesome food, which none need be afraid of using on the score of health.

DIET FOR SPECIAL CONDITIONS.

Food for Infants.

No food for infants has been found to equal mothers' milk, and this has not been for any lack of trying to find substitutes for it. Dr. Brouzet, a celebrated French physician, thought so poorly of mothers that he wanted the state to interfere and forbid women from suckling their children, as the best means of preventing disease and immorality, and Van Helmont, the leading chemist and physician of his age, seemed to attribute all our diseases, if not our sins, to the inborn propensity for milk. He proposed to substitute bread boiled in beer and honey for milk in the rearing of infants. These are shining examples of that scientific arrogance which is so prone to inflict its latest opinion upon mankind as unerring truth.

Mothers' milk is the only safe, natural and perfect food for infants; there is and there can be no perfect substitute for it. It is complete in its composition and perfectly adapted by nature to the growth and nourishment of the new-born. Cemeteries have been filled because, being ignorant of this fundamental truth of nutrition, people have tried to substitute something "just as good" or "better" for the food designed by nature for that purpose. The vast majority of deaths in children of one year and under is due to improper food

substituted for mothers' milk by ignorant and careless parents.

So large is the mortality of bottle-fed babies that one can come to no other conclusion than that the refusal or neglect of a mother to nurse her child, for any but the most necessary reasons, is little short of criminal. No considerations of personal convenience, nor of retaining the figure, nor of the requirements of fashionable life, render neglect of this duty, in the slightest degree, excusable.

The following reasons for artificial feeding are legitimate: When the mother has no flow of milk and cannot be made to have any; when the child does not thrive and cannot be made to thrive by intelligent effort to improve the quality of the milk; when the mother is affected by some serious chronic disease (Bright's disease, epilepsy, tuberculosis, etc.) or when pregnancy occurs during nursing. Under these circumstances there must of necessity be found some substitute for the natural food, and it becomes our duty to find the best substitute. The first thing is to avoid being taken in by the alluring advertisements of proprietary foods; most of these foods are merely modifiers of cows' milk and incapable alone of supplying sufficient nourishment for a growing child. They are valueless without cows' milk and they add nothing to cows' milk that cannot be added at the home at one-fourth the cost. Every physician of moderate experience meets numbers of cases of scurvy, rickets and other forms of infantile ill health, caused by too great dependence upon some of these advertised foods.

It is unfortunate that the money-making propensity of mankind has taken hold of this subject, and, by assiduous advertising, forced upon the attention of the public these proprietary foods as substitutes for mothers' milk. One of the bad results of this is that the public has been falsely educated to regard the substitution of patent preparations for the natural nourishment as rather a good thing for the baby, or at least a matter of indifference.

Of the many preparations upon the market, some are moderately good, some are bad and most are more or less fraudulent, in that they pretend to be the main nourishment of the infant, when they are really only modifiers of cows' milk. They all agree in being expensive, and not one is as good an infant food as can be made cheaply in the home. The chief faults of the proprietary foods, besides their cost, is deficiency in fat and a too great quantity of sugar or starch.

Cows' milk, properly diluted and modified, is the best substitute for nursing. The differences between human milk and that of the cow are as follows:

Human milk is alkaline, cows' milk is neutral or acid, human milk contains half as much protein as cows' milk, and its protein is about equally divided between the kind that is coagulable by heat and the kind that is coagulable by acids. In the milk of the cow there is one part of the first kind to seven parts of the latter. This makes a great difference in the character of the coagula of the two; cows' milk forms large, solid, relatively indigestible curds; human milk coagulates in fine,

easily digested flocculi. The composition of the two milks is here shown side by side:

	Human Milk.	Cows' Milk.
Protein	2 per cent	4 per cent
Sugar	7 per cent	4 per cent
Fat	4 per cent	4 per cent
Salts	.2 per cent	.7 per cent
Reaction	Alkaline	Neutral or acid

This shows the differences at a glance; there is twice as much protein, half as much sugar, the same amount of fat and over three times as much mineral matter in cows' milk as in human milk, and the reaction is different. This puts in sufficiently strong light, the fact that unmodified cows' milk is quite unsuitable for the nourishment of infants; it also suggests that by a very simple procedure it may be made quite similar to human milk.

The addition of an equal volume of water will render the amount of protein just about right and will reduce the minerals to a nearer approximation to mothers' milk. But this also reduces the fat to one-half and the sugar to one-quarter what they ought to be. The addition of cream and sugar then, in proper amount to the diluted milk, would bring up these two important principles to the normal standard of mothers' milk. From this it is seen that the modification of cows' milk consists in the addition of water, sugar and cream to that fluid.

Before going into the details of modification it should be insisted upon that the cows' milk be fresh: not over 24 hours should intervene between

the cow and the baby. It should be from a herd rather than from one cow; an average mixed herd is better, because more apt to be free from disease than Jersey, Ayrshire or Alderney cows. It should be clean and free from foreign odors.

The food of the cows should be clean grains and grass. There is no objection to malt refuse as a cattle food, if it is properly dried and preserved and due allowance made for the fact that part of its carbohydrate is gone. The widespread prejudice against milk from cows fed upon malt refuse arises from the fact that a moist, sour and decomposed product is often used.

Milk Modification.

Milk nowadays is generally dispensed in cities and towns in wide-mouth, so-called quart bottles; they often hold one ounce less than a quart, but they serve a very good purpose as a convenient measure for the household modification of milk. The milk as it is received, supposedly from the cow, may be called 4 per cent milk, the 4 per cent here referring to the fat. When such a bottle is allowed to stand undisturbed until the cream rises to the top, the *upper third* of it contains about 10 per cent fat and may be referred to as 10 per cent milk, while the *upper half* contains 7 per cent fat and may be called 7 per cent milk. The upper third and the upper half of such a quart bottle are the units used in the following formulas, and may be obtained either by decantation, that is, by carefully pouring off those parts of the contents of the bottles, or, more accurately, by using a small dipper made for the purpose and sold for a

trifle under the name of Chapin's dipper. As the necessity of using one-half and one-third of a bottle, and also for measuring 20 fluid ounces, continues for some time, it is in the interests of accuracy to paste a strip of paper half an inch wide from the bottom of one of these bottles to the top, and to mark it at the one-third and one-half, and also at the two-thirds or 20 fluid ounce heights. A little melted paraffin brushed rapidly while hot over the paper, will prevent its being washed off, when the bottle is cleansed. Such a marked bottle can be kept for a measure. The milk is allowed to stand in its original container until the cream rises, and then it is poured or dipped off into the graduated bottle up to the desired mark.

This plan of using the upper third or the upper half of a quart bottle, that is, 10 per cent and 7 per cent milk, is that which Holt recommends in his Diseases of Infancy and Childhood, and of the many methods that have been devised, it is the most satisfactory and successful for use in the home.

After it has been determined that the mother cannot nurse her baby, for good and sufficient reasons, we must select such a modified milk as is adapted, so far as possible, to the age and condition of the infant. For infants of three months and under, upper third milk is used, according to the following formulas. If the child is of ordinary vigor and average size the following mixture may be used to start on:

Milk sugar, 1 oz. (one rounded tablespoonful)
Lime water, 1 oz. (two tablespoonfuls)
10 per cent milk, 4 oz. (eight tablespoonfuls)

Hot water enough to make the whole measure 20 ounces. This will probably agree with most infants at this age. It is alkaline in reaction and contains

2 per cent fat
6 per cent sugar
0.66 per cent protein.

This is too weak to be ideal; the protein is less than half as much usually contained in mothers' milk, but owing to the inherent tendency of cows' milk to form large curds, this deficiency of protein is permitted at first. In feeble, undersized or delicate infants it is wise to begin with even a weaker milk, and as the digestive power grows stronger to increase the strength gradually (ounce at a time) until it is as strong as the infant's digestion will bear. For such cases the protein and fat may be reduced one-half:

Milk-sugar ..... 1 oz.
Lime water..... 1 oz.
10 per cent milk.....2 ozs.
Hot water enough to make 20 ounces.

The percentage composition of this is

1 per cent fat
6 per cent sugar
.33 per cent protein.

As the child grows the proportion of 10 per cent milk should be increased one ounce at a time. When the amount of fat reaches 4 per cent by doubling the amount of the 10 per cent milk of the first formula, the composition is

4 per cent fat
6.50 per cent sugar
1.33 per cent protein, and with this the limit of use of the 10 per cent milk is about reached, and the infant is probably just passing to the fourth month of its existence.

The sugar of milk in the 10 per cent milk is sufficient to bring that constituent in the last formula up to 6.50 per cent. For infants over the third month 10 per cent milk is too weak in protein, and the 7 per cent or upper half milk comes into use. If the last mixture is well borne the child may soon pass to the closest imitation of mothers' milk possible, made according to the following formula:

Milk-sugar ..... 1 oz.
Lime water.....1 oz.
7 per cent milk....12 ozs. (24 tablespoonfuls)
Hot water enough to make 20 ounces.

The percentage composition of this is

4 per cent fat
7 per cent sugar
2 per cent protein.

On comparing this with the analysis of mothers' milk on a preceding page it will be found to be identical.

Whichever of the various strengths be used, the result should be watched and further changes made if necessary, according to the indications. Constipation usually calls for a reduction in the protein and an increase in the fat, one or both. If curds appear in the stools the condition may be

removed by going back temporarily to the use of upper third milk. If vomiting occurs soon after feeding, it may be due to too rapid feeding, or to too large a meal being given, or to an old, foul, ill-smelling nipple, but if none of these are at fault the cause may be put down to too great strength of fat or protein, one or both, and the dilution may be increased.

The formula given above, that most closely resembles mothers' milk, is not the best to begin on; it does resemble the natural product in composition, but owing to the inherent indigestibility of the casein of cows'-milk, it is better to begin with a weaker preparation and then increase the strength as time goes on. It is much easier to increase the richness of the mixture than it is to lessen it after the baby's stomach has been upset by an attack of indigestion. Increase the strength of the mixture gradually, by an ounce at a time is a good rule.

Put just enough food in the bottle for a single feeding; if any is left, throw it away; never offer it the second time to the baby. This last rule should be looked after sharply by the physician, as it is often trangressed by the mother or nurse.

INTERVALS.—The interval between feedings should be carefully regulated; it is often difficult to get some mothers and nurses to observe regularity in this respect. Crying and fretting is not a sufficient reason to break the rule and feed between the proper intervals.

From birth up to about the third month, there should be two hours' interval between the meals during the daytime and one feeding, or at most

two, during the night (10 p. m. to 5 a. m.), or ten feedings during the 24 hours.

Toward the close of the third month, increase the interval to three hours and reduce the number of meals to eight in 24 hours. A gradual increase in the interval and decrease in the number of feedings should be observed until the end of the first year, when the ideal for most babies would be five hours' interval. The amount of food consumed at each meal must of necessity vary with different children, and exact quantities, as recommended in many books, cannot be observed. In the early days of life small infants will be satisfied with one ounce or less; larger ones require one and a half ounces or more. At the end of the first year a healthy baby will take from eight to ten ounces at a single feeding. The gradual increase in the weight of the child after the second week is the best test of success. Loss of weight is a danger signal, but quiet sleep is a very favorable sign.

In exceptionally delicate or small babies, although size and delicacy are not entirely interchangeable terms, milk sugar makes a better sweetener than cane sugar; it requires about double the amount of milk sugar to produce the same taste. For difficult babies, babies with idiosyncrasies, babies that have bad nights and do not gain as steadily as is desirable, magic results are often gained by substituting thin oatmeal or barley gruel in place of water in the above formulas.

One heaping teaspoonful of rolled or granulated oats boiled in a quart of water, in an uncovered vessel, until reduced by evaporation to the measure of twenty ounces, makes a thin gruel, when

strained, that serves to overcome the difficulties of some of these difficult infants.

Sterilization of Milk.—Fresh, clean milk does not need sterilizing; as before said, the sterilization of milk detracts from its nourishing power. On the other hand, sterilized milk is better and safer than dirty or contaminated milk. Therefore, if for any reason fresh, clean milk cannot be obtained, or if the milk is under suspicion, the process of sterilization should be used until milk above suspicion can be obtained. A double boiler, such as is used for cooking oatmeal, is convenient. Bring the outside water to a boil and then take off the stove, but allow to stand for 20 minutes. Then put milk in ice chest, or in a cool place, so that it will cool as rapidly as possible. Put into thoroughly clean bottles, filling them full, and cork.

Nursing Mothers.

The milk of the nursing woman is sedulously protected by nature against extraneous influences. It is the last of the organic fluids to be changed by irregularities of diet or by drug effects. Thus, an increase in the amount of fluid drank increases the urine, but not the milk; a decrease in the amount of fluid affects all other secretions first and the supply of milk last. During an attack of jaundice, every fluid and tissue of the body is affected before the milk shows any contamination with bile. It was noticed that during the siege of Paris, women continued to nurse their children, although almost starved to death themselves. Alcoholic beverages do not affect the milk directly, for distillation of the milk after a considerable con-

sumption of spirit showed no alcoholic contamination.

In the light of these facts, we may acknowledge our inability to produce any immediate change in the character of the milk by a change of diet, and look with suspicion upon any proprietary articles that claim to do so. They also teach us not to jump too readily to the conclusion that every attack of infantile colic is due to some mistake in the mother's diet. As exceptions to the general rule it may be noted that mercurial preparations and senna are drugs that do affect the milk; the first appears rapidly in the milk after a few doses and produces mercurial symptoms in the infant, and the second imparts its laxative properties to the milk in a mild degree. It is a safe rule for a nursing mother to avoid all drugs, especially those of a metallic character. Violent and depressing emotions, such as anger and chagrin, more profoundly affect the milk than food or drugs. A violent attack of jealousy is probably the most baleful in its effect. The appearance of the menses during nursing is occasionally followed by very serious illness in the infant, but this is not generally the case.

Being thus prevented by nature from producing any direct and immediate effect upon the milk by diet, we are limited to the general principle of keeping the mother in good health and supplying her abundantly with the proper elements for the needs of the growing child.

The proportion of protein in milk is in excess of the carbohydrates, and we may take this as a hint to increase the relative proportion of protein

in the diet of the mother over what is consumed by her when not nursing. If the rules on page 28 are followed, the desires of the woman will become a safe guide; in lieu of that, the following hints will be of service:

1st. Any diet that agrees with the mother and keeps her in good health will cause the infant to thrive.

2d. A little extra protein and fat are needed; therefore, fresh cows' milk is an excellent diet for the mother. One pint extra, beyond her ordinary food will furnish all the elements needed. Meat, with some of the tender fat, will do the same thing for those who do not like milk. A saucer of oatmeal with cream, or a pint of oatmeal gruel, in addition to the ordinary food, will serve very well.

3d. The mistake of overeating and lack of exercise is to be avoided. Indolence and heavy eating decrease the flow of milk and deteriorate its quality. Exercise and fresh air are extremely important to nursing women.

It is a very common opinion that certain articles of food are invariably inimical to the child and are to be abstained from, no matter how much the mother craves them. An arbitrary rule of this kind is faulty. Some individualization of cases is needed before the good or bad effects of certain articles are settled. Foods that have come under the cloud of popular suspicion at this period are turnips, beans, lettuce, fruit, tomatoes and green, fresh vegetables generally. They should not be condemned wholesale, but if the mother desires some one of them it should be tried intelligently and the result will in all probability be very beneficial.

The foundation of much trouble and ill-health is laid in the few hours that intervene between the birth of the child and the arrival of the milk, by injudicious feeding and ignorant management. The first necessity for a prosperous career as an infant is warmth. The hands and feet of the baby should not be allowed to become cold. Elaborate washing and dressing in fine clothes must all give way before this imperative requirement of warmth. The second necessity is that the first thing that enters the baby's mouth must be from the breast of the mother, and from nowhere else. The erroneous idea that the baby must have nourishment before the milk comes to the mother's breast is responsible for much gastric disorder and subsequent colic. The infant arrives upon the scene with a sufficient store of nutritive material in his or her system, to last perfect until such time as the milk arrives, usually 48 to 72 hours. The small amount of colostrum which the first efforts at sucking draw forth will help greatly in keeping the infant contented until the full flow of milk arrives.

Occasionally a few drops of pure water will contribute to the comfort of the baby, and it should always be given when the child is restless and fretful immediately after birth, when it ought to be sleeping; this is especially true when the baby is born in very hot weather.

In regard to the intervals between nursing, there is nothing that so conduces to the health and comfort of the mother as the formation of regular habits in this respect. Do not nurse too often; do not put the baby to the breast simply because it is crying. Never use such a means of soothing

sooner than the regular time; never allow the baby to fall asleep at the breast unless at the end of a meal. Never allow the baby to nurse while the mother is asleep. To preserve the symmetry of the shape, as well as to insure a regular flow of milk, use the two breasts equally and in alternation. Weaning should be gradual, beginning at the sixth or seventh month, when the first tooth appears, by assisting the breast with some appropriate outside food.

The physiological time for the cessation of the nursing period is, on the average, about the tenth month, although the time may be somewhat shortened or somewhat lengthened without harm. At the seventh month, when the first tooth usually appears, a beginning of outside feeding may be made, but should not be carried to any great extent until more teeth come.

Old Age.

As the years pass by the respiration grows more shallow, the power of digestion weaker, the walls of the arteries become hardened by the slow accretion of earthy matters, and the fibers lose their elasticity. The veins become dilated, the skin grows dry and shriveled and the cartilages of the larynx ossify, changing the voice to a shrill treble. These and the more obvious changes, such as the loss of the teeth and hair, the bent form and the dull eye, warn us that the dietetic habits of middle life and of youth should not be continued when old age comes on.

The body in the last analysis may be considered as a network of exceedingly minute fibers and

tubes, woven into the many tissues that make up the human form. The idea of a web or a reticulated structure is involved in the name "histology," which is the term applied to the study of the minute structure of tissue. The food that enters the mouth must undergo the most minute subdivision and solution in order to pass through this corporeal network in the processes of digestion and assimilation. This passage of nutritive material through the body is a continuous process from the first to the last day of life. Those who have watched the process of filtration of turbid fluids in the laboratory must have noticed how rapidly the fluid runs through the fresh filter, and how, as the minute interstices become clogged, it runs slower and slower until at last it comes through drop by drop. The new filter is like the clean and flexible tissues of youth, that rapidly eliminate the deleterious excreta of the body, and the debris-clogged filter is like the stiff, inflexible tissues of age, obstructed with the insoluble residues of food that have been poured into the body for years.

When we consider the great quantities of tough, fibrous and indigestible material, augmented in amount by man's propensity to self-indulgence, that enter the mouth during the lifetime of an individual, it is no wonder that those delicate organic pipes and tubes of which the human body is composed become clogged or that the fibers grow stiff and brittle. The phenomena of old age have their roots in this tissue-clogging process.

To realize this, compare the soft, elastic skin and flexible joints of youth with the stiff limbs, slow movements, wrinkled features, dry skin and gouty

deposits of old age. The phenomena of age occur with many prematurely, simply because of habitual errors in eating. The tissues become choked and clogged sometimes from the ingestion of too much food, sometimes from food of an unhealthy character, and sometimes from both. The approach of senility is greatly aided by worry, anxiety, indolence and irregularity.

The first sign of old age is often an agreeable one and observed with self-congratulation. Somewhere between the ages of 35 and 45 it is quite a common symptom for an individual to become plump. He looks better and younger than for some years previous; friends remark how well he is looking and he observes with complacency that the looking-glass no longer reflects certain familiar wrinkles. This fullness of face and gain in weight is just as much a sign of increasing years as gray hair or wrinkles. It is retention, a slowing up of elimination and not an accession of sound tissue that produces this sudden gain of weight.

Therefore, as the years roll by, it behooves a man to see to it that the ingestion of food does not exceed his powers of elimination. There is no better rule for holding on to youth. If he has lived ill, there will never be a better time to correct past errors; if he has lived well now is the time to continue and improve his habits, in order that the fruits of past regularity may be fully enjoyed.

Temperance and regularity should be the presiding principles of the old man's life. A scrupulous regularity as to times of eating is of great service, for the numerous organs of the body that are beyond the direct control of the will are suffi-

ciently amenable to the voluntary parts to have good habits formed in their operations and functions by external regularity. Further, it will be found upon examination that men and women who have attained extreme old age have, almost without exception, been very abstemious in their diet. This is in agreement with reason, for not only is the metabolic power of the cells weak and the tissues apt to be clogged, but the bodily activity is naturally less. The flickering flame of life is a hundred times more apt to be choked by an overplus than to fail from too little fuel.

The activity of the old is less; they therefore need relatively less of tissue-forming foods.

The bodily heat needs to be maintained; they therefore need relatively more of fat or sugars, or both.

The waning powers of elimination and assimilation indicate that the total amount of food should be diminished. The decay and loss of the teeth show that hard and fibrous food is not appropriate, and the character of the food in this respect should depend somewhat upon the state of the teeth.

Whatever else may be neglected, the thorough insalivation of the food should not be. The absence or inefficiency of the teeth make this imperative. Even hard food is safe if it be chewed, bit, munched, rolled, pressed, macerated and comminuted in the mouth, until completely reduced and made alkaline.

The utmost deliberation in eating is therefore a *sine qua non* of the health of the aged. Under these conditions the following foods are capable of continuing the attenuated thread of life indefinitely.

Follow carefully the directions on page 28 in regard to the manner of eating.

Bread and rich milk. Select the bread (white, brown, wheat, rye or corn) most pleasing to the taste.

Rice and rich milk.

Any well-cooked cereal and milk.

Buttered toast and tea.

Bread and bacon.

Small amounts of roast or broiled meats during special activity in the open air.

Eggs, brown bread and potato.

Honey, figs, dates, cocoa, chocolate, turnips, lettuce, carrots, spinach, celery and fruits in general, especially apples. For beverages, tea, coffee, chocolate, wine and whisky, all in moderation and never more than one kind at one meal. Plum pudding, pies, mincemeat, butter cakes, fruit cakes, doughnuts, greasy fried foods must be abstained from.

It will be seen from this that the kind of food selected for the aged is not so important as the regulation of the amount, and the manner of eating it. The following points cover the subject:

1st. Simple food (not rich, not spiced, not highly flavored, not too much mixed).

2d. Attention to the thorough and complete insalivation of each mouthful.

3d. Care that the moderate amounts demanded by natural appetite are not by one jot exceeded.

If a definite figure be requested, it may be suggested that for an old man of 140 pounds, doing little or no manual labor, the total amount of the above food might be limited to 20 ounces, divided into two or three meals, as desired. There can be

no objection to wine, taken moderately and regularly, if the individual wants it. Also there is no special reason for advising it.

Brain Workers.

It has been found by careful experimentation, the most recent and accurate of which is Atwater's, that severe and continuous mental labor causes no more tissue waste than absolute rest. That is to say, the most accurate instrument with which we are acquainted, is unable to show that mental activity affects tissue waste any more than absolute rest. That there is a difference is certain; whether science will ever be able to demonstrate it or not is problematical. Cholestrin seems to be increased by mental work and is eliminated by the bile, but the metabolic changes involved are not such as a respiration calorimeter is capable of showing.

Brain workers are very apt to be sedentary in habit and not infrequently such work is accompanied by high living and late hours. Such a life, namely, plentiful eating and drinking, with bodily indolence, tense nerves and worry, is the best possible combination for bringing on an early breakdown, as pointed out under Bright's disease.

There are no doubt special brain foods, or foods that especially nourish the nervous system, but as yet we do not know just what parts of food they are from the standpoint of exact experimentation. Under these circumstances we must depend upon practical experience.

In the first place, the brain is less directly dependent upon food than any other organ. It is a

general rule that the higher the function of any organ the less it suffers from withdrawal of food, hence, the brain being the highest organ in the body, suffers the least of all. It is a matter of common observation that the brain works better under a light diet and best of all under abstinence from solid food. All the tissues yield to it in importance, and as a consequence it draws aliment from all the other organs, as ministers and servants, when the external food supply is deficient. The ideal diet, therefore, for a brain worker is a very light one, of a not too easily digestible character, at the same time the food should have sufficient residue to prevent constipation.

Fine white bread should be avoided, and the coarser breads selected. Graham, entire wheat, oatmeal crackers, pumkernickel (whole rye), corn bread and Boston brown bread offer sufficient variety to select from. The feces from an exclusive diet of Graham bread outweigh and are greater in bulk than those from an exclusive diet of entire wheat bread, by double, and from the feces of a patent flour bread diet by a quadruple proportion. This bulkiness of intestinal contents takes the place to a certain extent of exercise and tends to obviate the constipation of sedentary pursuits. The slight waste of starchy matter found in the bulky stools is of no great importance. The objection to fine white bread also extends to meat, with the additional disadvantage, that the nitrogenous products of the digestion of meat encumber the internal organs more than vegetables.

The no-breakfast plan works well with many sedentary brain workers. During the morning hours, if the stomach is empty, the mental faculties

are generally alert and the best work can be done. There are thousands of people who have no appetite for breakfast and simply eat in conformity with a long-established habit. They form the "cup of coffee and a roll" brigade so numerous in the United States.

With such people there is a certain repugnance to solid food in the early morning. If such people will make a trial of the no-breakfast plan they will probably be surprised at the improvement. The following menu will serve to give an idea of the amount and kind of food recommended for mental and sedentary occupations:

Breakfast: Either none or a cup of coffee.

Lunch: One or two caviar sandwiches made with coarse bread, lettuce, cucumbers and a banana with cream; chocolate or tea, as preferred.

Dinner: Meat, fish or eggs, toast and butter, spinach, tomatoes, ice cream and tea.

As a spur to intellectual effort there is no stimulus equal to a cup of black coffee, immediately followed by a cup of tea. They are the beverages of the intellect.

During continuous mental work, without exercise, the total food for a day need not weigh over 16 ounces. A rational liver, however, would take some regular muscular outdoor exercise, and his mental work would be all the better for it and more food would then be needed.

Diet for Muscular Work.

A liberal allowance of carbohydrates, one-eighth to one-fourth as much protein, and plenty of fat if the climate is cold, will give power for sustained

hard labor. In a well-developed individual with sound heart and vigorous digestion, an enormous amount of labor can be accomplished on food of the above character, amounting to 4,000 or 4,500 Calories. The diet need not be greatly varied except for the purpose of pleasing the palate; indeed, if confined to a few standard articles of food the life is simpler and the results better.

When first starting in on severe labor the muscles will become stiff, and some little time may be required before a proper equilibrium is established. If the amount of food is correct and the elimination good there will be no loss of weight, the eye will be bright and the muscles will soon recover from the exhaustion of a hard day without stiffness. If the work is in the open air more food can be taken with advantage; when the task is a strenuous one, taxing the utmost power of the individual, but not of long duration, a liberal supply of meat gives the best results, because it yields up its energy quickly, and is thus like a fuel that, burning quickly, makes an intense heat. When a sustained, long-continued effort is to be made the cereals undoubtedly give the best results. Barley was highly esteemed by the athletes of ancient Greece on account of the endurance it imparted. It is the rapid generation of power from the protein of meat, that has rendered the beef, mutton, toast and tea diet so popular with athletes training for races, prize-fights and other short-lasting demands for a supreme effort. That a man so fed cannot be held long in a tip-top condition is shown by the fact that after reaching the acme of his powers he falls away or becomes stale, no doubt

owing to the large amount of nitrogenous debris that clogs his system.

Bread and milk, simple as it is, gives the materials for hard and enduring labor in admirable proportion, as their analysis shows. Bread contains 8 or 9 per cent of protein, 51 to 55 per cent of carbohydrate and 1.5 per cent of fat, with a little over 1 per cent of minerals, and yields 1,250 Calories to the pound. Milk contains 3 or 4 per cent of protein, 4 per cent of fat, 4 per cent of carbohydrate and .7 per cent of ash, and yields 780 Calories to the pint. Two pound loaves of bread and three pints of milk furnish 4,600 Calories, and a steady diet of these standard foods can be borne longer without monotony offending the taste, than of almost any other foods. A little meat, a little fruit, a little coffee or tea, makes a sufficient variety, so that it can not only be tolerated, but even relished indefinitely. Oats prepared as a porridge answers the same purpose excellently, but is not relished for so long a time. Owing to the large proportion of water used in its preparation, the per cent of food principles in boiled oats is much reduced from what the dry oats yield, but the relative proportion is good; the ratio of protein to carbohydrate is higher than in bread and milk.

Boiled oatmeal, that is, porridge, contains 2.8 per cent protein, .5 per cent fat and 12 per cent carbohydrate; a pound of it yields 285 Calories. An excellent instance of its power of giving sustained endurance during hard labor was shown by the remarkable feat of the Great Western Railway of England in the summer of 1872. "It was necessary to shift the rails from the broad to the nar-

row gauge on upward of 500 miles of permanent way within a fortnight. The task was enormous, for the Great Western is one of the few English lines whose rails are held down by bolts screwed into nuts. All these had to be unscrewed and replaced after removing the heavy rails two feet. About 3,000 men were employed, working double time, from 4 in the morning till 9 at night, and, without one being sick or drunk, they accomplished the work in the prescribed time. The scheme for generating muscular power was this: The men were hutted along the line, so as not to waste their strength by coming and going, and they brought with them bacon, bread, cheese, cocoa, etc., to provide their usual meals at the usual times. But they had no beer nor alcohol in any form. A pound and a half of oatmeal and half a pound of sugar was allowed extra to each man daily, and for every gang of 21 a cook was provided.

"The first thing done in the morning was to breakfast, and then the cook and his cauldron started along the line till water was found convenient, a fireplace of stones was built, the fire started and the pot boiled.

"Oatmeal was then sprinkled into it with sugar and thoroughly well boiled, till a thin gruel was made. As soon as "the shout for drinks" was heard, buckets were filled and carried around with small pannikins to convey the liquid to the panting mouths. The men liked it exceedingly, and learned by experience the importance of having it well cooked."

The error that is oftenest made by professional trainers and athletes is carrying the meat food principle to an excessive degree.

During a protracted feat of endurance a food is needed that will absorb and assimilate with little expenditure of energy, and supply the muscles with fuel; for this purpose there is nothing so admirable as lump sugar. Instead of the large quantities of meat usually eaten as a part of the training for athletic events, it is recommended that after a six-day course of beef or mutton and toast to reduce weight and remove superfluous fat, cereals largely take the place of the meat. If food is needed during the trial we recommend sugar, and after the effort is over a large bowl of infused tea, sweetened, but without milk, as the best restorative.

Food for Anæmia.

It should be remembered that anæmia is a general term for several conditions of the system. Any abnormal variation in the quantity or quality of the blood comes under this head; it may refer to a reduction of the blood as a whole or to a lack of certain important constituents, such as the red corpuscles, the albuminous constituents or the hæmoglobin.

The diminution of the blood as a whole is commonly due to hemorrhage of a sudden and profuse character; the condition is serious in proportion to the amount of blood lost and the suddenness of its withdrawal. It may be necessary, in order to save life, to resort to subcutaneous injections of normal salt solution (Note VIII). This is necessary when the patient is in collapse, the surface cold, the pulse small and rapid and the countenance drawn and peaked.

Under these conditions the absorbents of the alimentary canal cannot be depended upon, and the

only food imperatively demanded is a weak salt solution, but administered by subcutaneous or rectal injection.

In less severe hemorrhages, which are by far the most frequently met with in practice, the patient is able to swallow, and there is an eager and insatiable thirst present, as an indication of the proper method of introducing fluid to make up the loss. After a hemorrhage the watery and saline constituents of the blood are quickly restored by absorption. The albuminous elements are also made up with comparative ease, but it may take weeks or months before the red corpuscles—those minute organic forms peculiar to blood—are regenerated. The food that corresponds most closely in chemical elements is milk, and this result of analysis is fully borne out by experience. Iron, however, which is of extreme importance to the blood, is very scantily represented in milk. It would take something like 6½ pints to furnish the 1-6 of a grain of iron that is daily used up in the system, and much more than this is needed when the system has been depleted by hemorrhage. A little excess of iron at such a time does no harm, as the red corpuscles cannot be regenerated without it.

The ideal food, therefore, to restore the losses by hemorrhage is milk plus a small amount of iron. It has been my plan to add 5 drops of dialyzed iron to as much strictly fresh milk as the patient is likely to consume in a day. This amount of iron does not curdle the milk nor change its taste in the least. It rapidly changes into an easily digestible oxide. This is about thirty times as much iron as the body uses per day in the normal condition, and furnishes, therefore, an abundant surplus

for the regeneration of the red blood. It must be shaken before each draft of it.

It is a useful rule in practice that so long as the patient complains of thirst and is capable of demanding drink, the natural method of introducing fluids is sufficient, but when there is such a state of collapse that either no thirst is felt or else the patient is not able to express it, subcutaneous or rectal injections must be quickly resorted to.

Anæmia is frequently produced by long-continued drain upon the albuminous constituents of the blood, such as occurs in chronic suppuration or in Bright's disease. Lactation, although a natural process, may produce the same condition when too prolonged. When the drain comes from a chronic flow of pus there is an especial need for nuclein and fat. Eggs, and especially egg yolks, milk, sweetbreads and glandular organs in general, shad-roe and caviar all present these elements in a digestible form. Bright's disease has been spoken of in a separate chapter. In chlorosis the lacking element is purely iron, for in this disease the subcutaneous fat is well maintained. As an average there is about one-sixth grain in the ordinary food of a day.

To keep up the quality of the mother's blood during lactation a pint of oatmeal gruel a day, in addition to the usual food of the woman, is all that is necessary. It should be divided to suit the wishes of the individual, and the same applies to flavoring.

Resume: For hemorrhage, milk, either whole or diluted with water, according to circumstances, to which the necessary constituent iron has been added in the proportion of five drops of the

officinal solution of dialyzed iron to a quart. After immediate danger is passed and the patient, although pale and weak, is able to digest solid food, green vegetables, and especially tender green peas, are the most appropriate because of the preponderance of potassium salts in these articles of food over sodium; the red corpuscles, the most difficult element to restore and the slowest in reforming, are rich in potassium and require much of it.

Anæmia from loss of rich albuminous fluids, as pus or semen, requires food rich in nuclein, such as eggs, especially egg yolks, sweetbreads, liver, shad-roe and caviar.

Chlorotic anæmia needs iron food—spinach, green vegetables, oats, lentils, apples and strawberries.

Lactation: A pint, or about that quantity, of oatmeal gruel a day. It should be flavored and divided into two or three portions, according to the wishes of the patient. The following list of foods is in the order of their richness in iron:

Spinach.	Oats.
Egg yolks.	Strawberries.
Beef.	Beans.
Apples.	Peas.
Lentils.	

Diet in Various Diseases of the Stomach.

Sour Stomach.—The reaction of the stomach contents is normally acid, hence by sour stomach is meant an abnormal degree of acidity. Two acids are usually found in the stomach after a meal, independent of any acids that may have been taken

in the food, namely, hydrochloric acid and lactic acid. The first is derived from the blood and the latter from chemical changes in the starchy and saccharine food.

Sour stomach, in the abnormal sense, may arise from either of these two acids, namely, from an oversecretion of the hydrochloric acid or from too great a production of lactic acid from fermentation of the carbohydrates. These two conditions are frequently confounded under the names of acid dyspepsia, sour stomach, heart-burn or pyrosis. The name usually adopted for excess of hydrochloric acid is hyperchlorhydria.

HYPERCHLORHYDRIA.—The obstinate acid eructations of the aged are most commonly of this variety; it also occurs in middle life, but is rare in children. It may be caused by the undue consumption of spiced and highly seasoned dishes, the alternation of very cold and hot drinks, the injudicious use of alcohol, the hasty deglutition of unmasticated food, the American habit of cooling off with ice water and of drinking ice cream soda. Mental depression, anxiety, fits of anger, grief and worry are also potent sources of this condition.

A distinguishing point is relief from food, especially meat or eggs, followed by a recurrence after the food is digested. The acidity of the urine is diminished. A suitable dose of an alkali, such as potassium carbonate, affords immediate, though temporary, relief. The dietetic treatment of this condition is the avoidance of the things just indicated as causes of it. Avoid spices and condiments, ice water, ice cream, very hot drinks, fat, heavy, greasy food and highly salted food. Cultivate serenity, deliberate eating and simple food.

Never touch the very sweet, very cold, very rich so-called Sundae sodas so much affected of late years by ladies and children. Abstain from alcoholic beverages or use them much diluted with water. The overeating of the most appropriate food is often responsible for an attack of hyperchlorhydria. Partial fasting, such as limiting food to one moderate meal a day, is a prompt cure. Many of these cases do well on a nearly exclusive milk diet. Others, strange to say, have been cured by buttermilk. The mild alkaline reaction of fresh milk helps to moderate the acidity and affords sufficient nourishment. Raw eggs are very unirritating and also help neutralize the free acid. Fats, starches and sugars should be restricted and a less amount of salt than usual should be consumed. A pure vegetarian, with this trouble, is in a bad way and should be advised that a temporary meat, egg or milk diet is necessary. The list of advised articles, then, is as follows: Milk, broiled lean beef, stale bread or toast very moderately, very little of butter or other fat, dry grated cheese, eggs raw or jellied, junket, and in some cases buttermilk.

After improvement, the diet may be extended so as to include carbohydrate with some small granuled starch, such as rice or cornstarch, or well-cooked tapioca and ripe fruit. The two latter used separately and not together, as they frequently are in the form of a pudding.

HYPOCHLORHYDRIA.—Sour stomach from fermentation. This is the more common variety, and is due to the excessive formation of lactic and butyric acids; sometimes also acetic acid. This condition of acid fermentation is a constant ac-

companiment of gastric catarrh, slow digestion, cancer, dilatation of the stomach and many cases of difficult digestion.

Hence it includes numerous cases, that vary a good deal in detail and arise from various causes. The immediate cause of the acidity, strange to say, is a deficiency of the normal hydrochloric acid in the stomach. Thus arises the strictly true paradox that the most common cause of sour stomach is a lack of sourness (that is, normal acid) in the gastric juice. It arises thus; the normal amount of hydrochloric acid (3 parts per thousand) inhibits the activity of the lactic acid-producing organisms and thus preserves the carbohydrates from fermentation and consequent acidity.

The golden rule of diet in all stomach troubles applies here: Eat little and masticate that little well. Buttermilk agrees with so many of these cases that it has earned the reputation of being particularly suitable, except when arising from dilatation of the stomach. Buttermilk contains about 1 per cent of lactic acid, and why or how it agrees when the trouble is due to lactic acid is not easily seen, but such seems to be the fact. Pastry, hot breadstuffs, puddings, fried foods and greasy foods must be absolutely avoided.

Appropriate foods are such as do not tarry long in the stomach, and also such as do not easily yield to the process of fermentation.

A raw or jellied egg or two, buttered toast and tea make an appropriate breakfast.

Broiled steak or roast beef, a little stale bread and greens, and a little custard for dessert.

Ham and eggs, tea, toast and lettuce.

Sugars, syrups and starchy food must be much

reduced. The following list of foods and time of sojourn in the stomach may prove useful in selecting articles of food:

Foods that Ferment with Difficulty.	Foods that Ferment Readily.
Beef.	Milk.
Game.	Rice.
Mutton.	Macaroni.
Chicken.	Cornstarch.
Ham.	Sago.
Cod and other fish.	Farina.
Bacon.	Bread.
Eggs.	Toast.
Spinach.	Syrups.
Boiled milk.	Cereals.
Asparagus.	Beans.
Cabbage.	Grapes.
Brussel sprouts.	Fruits in general.
Tomatoes.	
Celery.	
Cucumbers.	
Carrots.	
Cauliflower.	

Calves' brains, sweetbreads, pigeon, chicken and jellied or soft eggs remain in the stomach but a short time and are not inclined to fermentation. The less digestible foods, such as ham or beef, may be left out, until improvement is manifest or until required to break the monotony.

Meat and eggs should preponderate in most cases, and it is wise to keep the food at a meal limited to two articles. The total amount of food should be kept down. If the patient has not the

self-control to follow the directions upon page 28 the limit may be fixed at about 16 to 20 ounces in weight, of about 1,000 to 1,400 Calories value. The directions found in standard works are certainly too high (Einhorn, 2,863 C.; Friedenwald & Ruhräh, 2,456 C.). Occasionally cases will be found, which, to the surprise of the dietetist, do better on three pints of buttermilk and a few crackers than anything else.

Gastric Ulcer.—This condition is generally accompanied by hyperchlorhydria. In acute cases entire abstinence from food for a time is wise. Solid food, especially food with irritating particles, such as toast, coarse bread, all acids and fibrous vegetables, should be forbidden, even after improvement has been present for some time.

Milk, junket and strained rice-water mixed with milk must suffice in the early stages of the disease. Entire abstinence from food with rest in bed is necessary after a hemorrhage. Rectal feeding is not generally necessary, unless the patient is exceedingly weak and thin; when such is the case, a cleansing injection of warm, weak, salt water should be first used; after it has run off and the patient rested half an hour five ounces of lukewarm milk (temp. 102 F.) should be slowly injected rather high in the bowel, while the patient is lying on the face or left side. The process may be repeated every three or four hours, until the patient is able to eat. As soon as milk or junket diet grows monotonous albumen water may be substituted, also strained barley gruel, oatmeal gruel, and in some cases a little rich cream mixed with the gruel.

Ice cream may be tried, eaten slowly, and if

found to agree can be used every four hours, or occasionally, as a relief to monotony. Sweet cream (i. e., free from casein) diluted with twice its volume of cold water, to which a pinch of bicarbonate of soda has been added, has proved so great a boon in a number of cases that I am inclined to begin using it in all cases. The explanation probably is that cream and water so mixed and drank cold, passes rapidly to the intestine, where it is digested without molesting the stomach.

A patient who has once suffered an attack of gastric ulcer should avoid harsh foods for half a year after recovery, remedying the constipation that is apt to result from a smooth diet with small residue, by exercise in the open air and abdominal massage.

Gastric Carcinoma.—Cream diluted with water, either cold or hot, albumen water, raw or soft-boiled eggs, will furnish fat and protein. Strained gruels of oats or barley, salted, sweetened and flavored with a little port wine, supply carbohydrate. Meals should be small and frequent and the patient should live in fresh air as much as possible.

Meats, coarse breads and green vegetables are to be avoided. Cocoa or chocolate is a better beverage than either coffee or tea. The patient must be content with little. If hunger prevails over reason, select foods that tarry but a short time in the stomach, such as calves' brains, oysters, fish of the lean varieties (whitefish, carp, pike), cauliflower, mashed potatoes, fine white bread (no crust), scraped raw sweet apples.

Some authorities, impressed with the idea that

the patient's strength must be kept up, advise much food of a concentrated character, such as digested meat preparations. The trouble is that such feeding is more apt to keep up the strength of the cancer than that of the patient.

Dilatation of Stomach.—This condition is usually due to stenosis of the pylorus; the stenosis may be due to either benign or malignant disease.

The food for this condition should be given in small and frequent meals; it is a wise plan to drink little or no water and to select the drier kinds of food. The needs of the system for water can be largely supplied by rectal injections of pure water. Some cases thrive best when the greater part of the nourishment is protein foods with a minimum of starch; these are usually benign cases. The malignant cases seem generally to digest starchy food better than meats. The principal rules are:

Dry foods and little drink.

Rectal injections of water (8 to 12 ounces at a time, three or four times in 24 hours).

Predominance of the unfermentable nitrogenous food in benign cases.

A relatively greater proportion of easily digested carbohydrates in malignant cases.

Diet for Diabetics.

In no other affection that the physician is called upon to treat does the patient's comfort and the prolongation of life, so greatly depend upon a wisely regulated dietary as in diabetes.

Whatever views may be held as to the pathology of this obscure disease there is fortunately an

almost entire agreement as to the benefit to be derived from a restriction of the relative amount of the carbohydrates in the food. This is so plain and so generally admitted that the error of taking it too literally and of employing it without discrimination must be guarded against. Simple withdrawal of starch and sugar in all or in part does not comprise everything that can be said upon the subject.

Diabetics thrive better upon a moderate reduction in the carbohydrates than upon their entire withdrawal; moreover, there is a point in each individual case, in this respect, where the patient thrives best, that is, maintains the maximum of strength, and this point must be found by experimentation in each individual case.

The three factors by which the result of any diet is to be judged are the amount of sugar in the urine, the loss or gain of body weight and the feelings of the patient. An intelligent effort must be made to reduce the carbohydrates to a point where the patient's health is best preserved, the diminished carbohydrates being replaced so far as possible by an increased consumption of fats and oils.

In order to intelligently apply dietetic rules to particular cases it is necessary to ascertain the gravity of the condition by a test that will show the carbohydrate-digesting power of the individual. This requires some trouble and care, but when the knowledge is obtained it makes it possible to give a reliable prognosis and to correctly answer the question, "To what extent is it wise to restrict this patient's diet?"

The test is made by putting the patient for a few days (four or five) upon a diet from which carbohydrates are rigidly excluded, i. e., beef, mutton, pork, ham, bacon, fish, eggs, butter, lettuce, spinach, cucumbers with water and unsweetened tea or coffee for a beverage. If sugar persists upon this diet the case is a severe one and the prognosis grave, for the reason that the sugar must be produced from the protein in the tissues themselves. During the test the patient should live a very regular life in regard to exercise and care should be taken that there are no unusual emotions.

In many cases the sugar will disappear entirely from the urine after the first 24 hours of the test period. This shows that the case is a mild one.

As soon as it has been demonstrated that the sugar has disappeared cornstarch in known amounts is added to the diet until sugar appears once more in the urine. The other conditions remaining the same, the amount of cornstarch that can be added to the diet until sugar just appears shows the carbohydrate digesting power of the patient.

Some patients seem to consider the time of the test period as a very severe one; others do not mind it much. As great variety as possible at the different meals, but still within the prescribed limits, should be offered; the patient should be under close observation, to see that carbohydrates are not eaten unwittingly.

Cases will also be found in which the strict test diet removes all sugar from the urine, and yet the smallest amount of starch brings it back again; such cases would rank between the severe and the

mild ones. The following facts should be remarked: fats never cause sugar in the urine. Alcohol does not produce sugar in the urine. Exercise diminishes the sugar in mild cases and is then beneficial, but it increases it in severe cases and is then deleterious.

In arranging a suitable dietary the following principles should prevail:

For the mild cases: The amount of protein, such as meat and cheese, need not be changed. The fatty food should be increased at the expense of the starch and sugar. If two ounces of bread are borne before sugar appears in the urine that much bread is allowed; if six ounces of bread are borne that much is allowed.

For the more severe cases: The proportion of the protein should be increased, the fats increased and a sufficient amount, but no more, of starchy and saccharine food allowed to give the patient the maximum of strength.

In the severest cases, the ones in which urinary sugar persists upon the strict test diet, showing the case to be hopeless, the principle of giving the patient the greatest amount of comfort enters into the field; in other words, the restriction must not be carried so far that in order to keep a little sugar out of the urine the patient is made very uncomfortable by severe deprivation. The protein should be somewhat decreased; the fat should be increased to the greatest extent possible; that is, all that the patient can digest should be given and pains should be taken to present it in various ways, so that it may not become offensive. Then that minimal amount of starch and

sugar which has been proved in the case under treatment to be the best.

It has been found that patients suffer more from the deprivation of bread than from any other form of starchy food, and it is well to give what starch is allowable in the form of bread. The lack of sugar is better borne, especially with some slight assistance from saccharin.

The total amount of urinary sugar should be considered, but too much stress need not be put upon that feature alone, as is sometimes done. If the patient feels miserable and is gradually failing in strength he or she is not doing well, even if all the sugar has been driven out of the urine.

The general prosperity, the feeling of well-being and the maintenance of the strength and body-weight of the patient has far greater importance than the amount of urinary sugar.

In addition to these general rules, if acetone appears in the urine or in the breath the amount of carbohydrates should be immediately increased. (See Note IX.)

Fat is better liked and better digested with carbohydrates than without them, and there is room for the exercise of considerable ingenuity in making less obvious the fatty character of the food. Steamed and mashed potatoes may be made to carry a great deal of butter and cream without altering their flavor much. Spinach, turnips and salads may be made to do the same thing and serve as a vehicle for butter and olive oil. Bread or toast fried in bacon fat also serve a useful purpose, and when eggs are used they should be scrambled with an extra quantity of butter.

A list of foods is here given, and their content so far as carbohydrates go.

Foods that are practically free from carbohydrates: Meats of all kinds except liver, fish of all kinds, cheese of all kinds, cottage cheese, cream, eggs, fats and oils, Baker's chocolate, spinach, cucumbers, lettuce, asparagus, sauerkraut, celery, cabbage, cauliflower, tomatoes, gelatin, coffee, tea and whisky.

Foods that contain a small amount only of carbohydrates, and are hence allowable in reduced quantity: Liver, giblets, shad-roe, sausage, turnip, oysters, clams, eggplant, string beans, radishes, walnuts, hazelnuts, almonds, cocoanut, Brazil nuts, carrots, parsnips, beer.

Foods that contain larger amounts of carbohydrates and hence are to be used in greatly reduced quantities: Sugar, cornstarch, tapioca, sago, arrowroot, honey, bread, potatoes, rice, macaroni, apples, peaches, berries, plums, cherries, bananas and fruits in general.

As great variety in food as is consistent with the object in view should be maintained. In substituting one carbohydrate for another, with this object an equivalent value rather than an equal amount should be given. Thus 2 ounces of stale bread contains as much carbohydrate as:

1.2 ounce arrowroot.
6 ounces white potatoes.
1.5 ounce lentils.
1.5 ounce cracked wheat.
1.5 ounce rice.
35 or 40 ounces tart apples.

The great value of potatoes and apples in relieving the monotony of the restricted diet are evident at a glance. Milk is sometimes greatly missed by diabetics who have become habituated to its use, and may be prepared free from sugar by the following method:

Warm one quart of milk to blood heat (100 F.) and add one fluiddram of hydrochloric acid diluted with three ounces of water. Stir and allow the mixture to stand for five or ten minutes. Collect the separated casein by straining the mixture on a fine strainer and allow to drain without pressure. Pour very slowly two pints of water upon the casein, stirring it, so as to remove most, if not all, of the acid. When it has drained dry, place in a mortar and rub to a smooth paste with 40 grains of potassium hydrate dissolved in three ounces of water. Add three ounces of rich cream and 50 grains of pure gelatin previously dissolved in warm water, one grain of saccharin and water, to make one quart.

This milk contains all the elements of milk except the sugar and salts and retains the flavor and taste of milk.

The physician will meet certain cases excreting urinary sugar in spite of a very strict diet, whose system seems to resent the restrictions that have to be imposed. Although there is no good explanation for it, such cases may do well upon an entire change of food. They may be put upon Van Noorden's oatmeal regimen. It is applicable to severe cases only as the milder cases do not do well on it.

A good quality of rolled oats should be well cooked with the addition of a little salt and

toward the end of the process a large proportion of butter added. As soon as the temperature falls below the coagulating point of albumen the whites of one or two eggs beaten to a light froth are stirred in. It is eaten without other addition.

The quantities needed by a person of average weight are about as follows:

Rolled oats, 8 to 12 ounces.
Egg whites, 5 to 6 ounces.
Butter, 8 ounces.

The butter should be of the finest quality and free from "off" flavors. Limited as this diet is, many patients prefer it to that which is usually recommended. Black coffee or tea without either sugar or milk is allowed, and Van Noorden recommends an occasional vegetable day to relieve the monotony. In all cases except the severest ones he recommends an occasional period of a few days of the test diet, with the view of re-educating the system to absorb the carbohydrates.

Prognosis: Cases occurring in fleshy old people are apt to be mild; the younger the patient and the leaner the more rapid and fatal the case.

The amount of food eaten by diabetic patients must be larger than in health owing to the waste of carbohydrate in the urine. If the digestion is vigorous the amount of food may reach 48 ounces or more with advantage. The Calorie value will also run high owing to the increased proportion of fat, which we try to put in the diet; 4,000 calories is not too high, for the disadvantages and dangers of encumbered tissues disappear before the necessity of making up the waste that occurs in the urine and of keeping up the strength.

Diet in Bright's Disease.

To avoid Bright's disease is of very much more importance than to give it the best dietetic treatment after it has been acquired. It is probably one of the most avoidable of the chronic diseases, if only a little self-restraint be employed habitually.

Feasting, anxiety and sedentary habits are the three things that cause the great majority of the numerous cases of this fatal disease. If a man engage in politics or in any business or profession that abounds in eating and drinking, that is accompanied with great nerve strain and little exercise, he had better look to it that about the time when he should be reaping the fruit of his labors, Bright's disease does not enter upon the scene and put a quietus upon all his enjoyments, if not upon himself.

To run the risk of getting it is easy, to actually get it is not difficult; the life that invites it is full of pleasurable excitement and the approach of ill health is so gradual that very frequently the disease is well seated before its unhappy possessor is at all aware that he is sick.

To avoid the grip of this fatal disease live plainly and simply, and especially abstemiously. To be more specific, avoid as you would the smallpox, course dinners beginning with oysters and proceeding through a long series of gorges to a rich dessert, the whole being well floated in intercurrent drinks of stimulants.

Eat regularly, eat lightly, chew persistently and never form the habit of eating simply as a habit; that is, do not eat simply because you have formed

the habit of eating. Consider what you are doing; think of the matter; select a moderate amount of nutritious food and eat it very slowly, chewing pertinaciously. Cut out the worry as much as possible and take regular exercise.

When you have got it, that is a different matter: death in an unpleasant form is impolite enough to stare you in the face and there will then be no difficulty to induce you to live in a rational manner.

The rational indications for food in this disease are to give the kidneys as little work as possible and to avoid such substances as irritate them. It is nitrogenous waste that frets the kidneys, but they also have water and earthy and alkaline salts to eliminate.

Acute Bright's Disease.—The dietetic treatment of acute nephritis, whether due to one of the exanthematous diseases or to cold and exposure, that is recommended in standard text-books, seems to be ill-advised. A standard work has the following: "The diet should consist of milk or buttermilk, gruel made of arrowroot, or oatmeal, barley water, and, if necessary, beef tea and chicken broth. It is better, if possible, to confine the patient to a strictly milk diet." As the relative proportion of nitrogen to carbon is very different in milk and in oatmeal, and as arrowroot has no nitrogen at all in its composition, there can be no propriety in recommending either the one or the other as an alternative. The rules for diet in acute Bright's disease are extremely simple—let the patient go as nearly without any food or drink as possible. The kidneys need rest above all things: they need rest more than the body

needs food. If owing to bodily weakness or from some other reason the doctor thinks some food necessary, then give a little arrowroot, but give as little as possible—just enough to effect your purpose.

The stereotyped advice to give an exclusive milk diet in acute Bright's disease is wrong in principle and bad in its effect. The world is yet suffering from the idea coming down from past ages—if there is anything the matter with you take something for it. We are always taking something but never does it occur to people to give rest to overworked and damaged organs.

As has been pointed out in another section, the products of the metabolism of nitrogen are a row of crystalline bodies, most of which are insoluble and some hard and gritty. The elimination of these nitrogenous bodies is a tax upon the kidneys, and especially undesirable in acute Bright's disease, where there is the most imperative need for functional rest of those organs. The plain indications are entire abstinence from both food and drink; even water should be restricted to the lowest ebb for a time.

When it becomes necessary that nourishment should be taken only a limited amount of food, easy of elimination, should be allowed. Milk, chocolate, buttermilk, oats, barley, beef tea, chicken broth should be strictly forbidden. Only non-nitrogenous or slightly nitrogenous food should be selected. Such are paps or gruels made without milk, of arrowroot, tapioca or cornstarch. Sugar and a little cream may be used to increase their palatability.

Meat and heavy foods should not be resumed

until convalesence is over and the health thoroughly established. During convalescence milk may be allowed with toast or milk and rice, tapioca, sago and a little fruit.

CHRONIC BRIGHT'S DISEASE.—Under this caption are here included all varieties of chronic inflammation of the kidneys; they are often indistinguishable from each other, and the same dietetic regulations apply very well to all the forms.

The first rule is total abstinence from alcohol; this should be without exception.

Spices such as pepper, both black and red, allspice, nutmeg and flavors depending upon volatile oils, coffee and tea and diuretics, such as onions, asparagus or parsley, are not to be recommended.

The loss of albumin in the urine is seldom found to be of amount sufficient to make any perceptible difference in the protein of the body, so that it is not necessary to increase that element of food in the dietary.

It is of especial importance to avoid nucleins and the extractive matters of meat in chronic Bright's disease, such as occur in glandular organs, sweetbreads, liver, kidneys and the like, meat soups and extracts.

The allowable articles are numerous; the main point is that the amount had better be restricted somewhat. They include bread, toast, cottage cheese, rice, honey, bacon, cheese, figs, dates, grapes, ordinary vegetables, rich milk and fruit. Such a list includes enough to satisfy a reasonable patient, and avoids those things which have probably brought the disease on.

Breakfast: The following are offered simply as samples: Two rolls and a cup of cocoa, an orange

and oatmeal porridge; or the same with the addition of an egg; or one half pint of cream with two rolls and some raisins.

Lunch: Bread and honey, rice with cream and sugar, bread and butter, potatoes and fruit for dessert.

Supper: Crackers and cheese, or cottage cheese and caraway seeds, or bread and milk and figs, or toast, cocoa and cornstarch pudding.

If the patient retires about 10, that is, as late as four hours after supper, a sandwich made of cottage cheese and caraway seed or cold tongue may be eaten before retiring.

In regard to drinking, water is the best beverage, but its use should be somewhat restricted, i. e., to about three pints a day for a man of ordinary weight.

The above is simply to serve as a sample, and not intended as an arbitrary arrangement. The patient should not be allowed to lose weight and after a week's trial, the further diet and the amount eaten may be regulated by the result of the previous week.

Dietetic Treatment of Gout.

As soon as an individual feels some symptoms of the oncoming of gout let him read Benjamin Franklin's dialogue with that disease in Poor Richard's Almanac. Though penned by the sage one hundred and sixty years ago, its truth and practical wisdom make it as valuable to-day as when first written. It is a disease almost completely under the control of dietetic regulations.

Although there are still some obscurities about the pathology of gout, authorities are in practical

agreement upon the question of the close relation between it and uric acid. Now, uric acid is one of that series of crystalline products frequently mentioned before in connection with the metabolism of protein, especially protein of animal origin. The nitrogenous bodies, nuclein, xanthin, hypoxanthin, and some others found in animal food, and the caffeine and thein in coffee and tea, when introduced into the body result in the production of uric acid. A very small, constant amount also is formed in the body by its own processes, quite uninfluenced by the quality of the food we consume.

Uric acid is a hard, gritty, crystalline, extremely insoluble substance, taking 18,000 parts of pure water to dissolve one part. A weak alkaline solution greatly increases its solubility.

With these data it may be easily comprehended how a limited amount of this insoluble principle may be held in solution in the blood and other alkaline fluids and circulate through the system and be eliminated with difficulty in neutral or feebly acid urine. But if, owing to heavy feeding, more of it be introduced than the fluids can hold in solution, there may be a sudden precipitation of the offending substance into the least alkaline part of the body, i. e., where there is no rapid blood current, in the tissues around joints, usually the small joints farthest away from the heart, like the great toe.

The sharp, hard crystals, bursting out of solution into and through the tissues of the joint, cause exquisite pain, and thus you have an attack of gout.

The amount of uric acid that the blood is

capable of holding in solution varies from time to time, according to the degree of its alkalinity. Activity in fresh air and sunlight, by increasing the alkalinity of the fluids, may hold an amount in solution that would bring on a severe attack in the impure air of the fireside or in a damp, chilly, cloudy atmosphere.

An amount that the system could easily hold in abeyance under ordinary circumstances might be immediately precipitated by free indulgence in wine, lemonade, beer or buttermilk. The tartaric acid in the wine, the citric acid in the lemon or the lactic acid in the beer and buttermilk (as the case may be) so reduces the blood alkalinity that the uric acid can no longer be retained, and the consequence is an attack of gout.

Muscular action results in the local formation of an acid, nearly identical with the acid of sour milk, called sarcolactic acid (Note X). Severe exercise of a group of muscles causes local acidity; this produces local precipitation of uric acid, with local stiffness and soreness of the overused muscles. Everyone has experienced such stiffness in parts of the body as the result of violent exercise.

Aside from hereditary tendency, which also is a factor, gout is caused by:

Overeating of uric acid-producing foods, or

By an overplus of acid beverages, one or both, or

By any circumstance that diminishes the power of the blood to hold the offending substance in solution.

Acute gout is less common than formerly, but many forms of chronic, ill-defined ill-health having their roots in the same condition of the system as that just spoken of, are becoming more com-

mon. Instead of running rapidly into the tissues of a joint with exquisite pain, the noxious substance slowly accumulates in the body in localities out of the rapidly moving blood currents, just as the floating debris of a river collects in the quieter corners out of the reach of the flowing tide; perhaps it gradually forms gouty concretions around the joints of the fingers, or, as occasionally happens, in the ear. In other cases it is gradually deposited in the walls of arteries, making them stiff and inelastic, and laying the train for an apoplectic seizure. In still others it may eat into the heart walls, causing a granular degeneration of its muscular fiber, winding up the earthly career of the patient with some form of heart failure. In still others it may disintegrate the texture of the kidneys, so interfering with their function that life is closed by uremic poisoning.

These insidious diseased conditions are to be avoided by the same dietetic rules as acute gout, and fortunately the indications are very clear. They are:

1st. Reduce the total amount of food.

2d. Abstain from eating glandular organs, such as kidneys, liver, sweetbreads, pancreas, mountain oysters, goose liver pies, spleen, etc.; also meat extracts and bouillons, meats and fish.

3d. Live on milk, eggs, bread and vegetables, and after six months of it add as much fruit as you please.

After six months to a year of such careful living the acids of fruit can do no harm. It is the combination of the above forbidden articles and acids that is so destructive. Fresh air and regular exercise greatly aid a wise diet. Persistence in the

above will cure the worst cases of acquired gout or any disease based on uric acid, and will greatly ameliorate the hereditary forms. No drugs are needed.

Diet in Heart Disease.

For valvular insufficiency, with dropsy, restriction of fluids and dry foods are beneficial. The fluid should be limited to 20 ounces a day and taken in quantities of a gill at a time. Two or three slices of dry toast and butter and a soft egg with 5 ounces of coffee and no water for breakfast.

The midday meal may consist of meat, toast, butter and tapioca pudding. For supper, white-fish, potato, one cup of tea and a simple pudding.

After a time a more liberal list must be allowed, especially as the appetite will demand it and the patient rebel against too much uniformity. The restriction serves not only to diminish the fluids of the body, but also revives a flagging appetite. After such a period of abstemiousness the patient is glad to get the plainest food. There is an idea here that physicians seldom think of employing which is extremely beneficial in many cases. Starvation, or at least extremely frugal living, even to the point of great weakness, is the only possible dietary that can benefit aneurism. Valsalva's diet for aneurism was a little bread and water, not over one-half pound per day. Tufnell's diet, being more liberal, can be maintained for a longer period. It consisted of 3 ounces of meat, 4 ounces of milk, 4 ounces of bread and butter and 3 ounces of claret daily. The principle is to increase the coagulability of the

blood and thus effect spontaneous cure. Gelatin foods are also beneficial. (Note XI.)

In stout people with fat around the heart, but with no degeneration of the heart muscle, a lean meat and tea diet with not more than six slices of buttered toast in 24 hours, is very beneficial. It should be combined with vigorous exercise in the open air, such as hill climbing.

Fatty degeneration of the heart requires, on the contrary, rest, freedom from excitement and an easily digestible diet, rich in phosphatic salts. Spinach, potatoes, asparagus, macaroni, eggs, especially the yolk, whitefish, chicken, bananas, milk with dialyzed iron as recommended under anemia, toast, stale bread and desserts of gelatine and junket form a list of sufficient variety. In all forms of weak heart no food should be taken between meals, the principal meal should be in the middle of the day and there should be a steady guard maintained against overdilution of the system with fluids. (Note XII.)

Diet in Obesity.

The obese condition may be due to an hereditary tendency, but is far oftener traceable to lack of exercise and overeating. The physician will find many people the victims of self-deception, in that they declare themselves to be small eaters, when a slight investigation will reveal that such is not the case. A variety of treatments has been advocated to reduce weight, ranging from the taking of drugs, such as fucus vesiculosis, phytolacca juice and diluted potassium hydrate, to the wearing of mystic girdles and light eating.

Any fat person who is in good health may bring about a wonderful decrease in fat and body-weight in a few weeks by confining the food to lean broiled meat and weak, hot tea sweetened with saccharin. The load of monotony may be lightened occasionally by a couple of eggs and by two thin slices of buttered bread or toast at a meal.

The reduction is in proportion to the strictness with which the individual observes the diet, and the regimen loses its effectiveness rapidly if starchy or sweet food is introduced to any extent. Plenty of exercise in the open air greatly aids and obviates some of the ill effects that so much nitrogenous food may entail. Individuals who are anemic as well as fat do not stand this regimen very well. It irritates the system, making them unhappy and restless.

Such a course of living is very effective in reducing weight, but it has the disadvantage of introducing the difficult products of nitrogenous metabolism into the system in great abundance and opens the door to rheumatic and gouty affections.

A more rational method, and a safer one, is to fast for two or three days and then, when an appetite has developed that contemplates the plainest food with lively pleasure, begin a course of slow methodical chewing of the usual diet, restricting the amount to about one-half the usual quantity.

Food that fills the stomach without greatly increasing the Calories are tomatoes, spinach, sauerkraut, radishes, celery, cucumbers and asparagus. Meat, bread, butter, tea and coffee may also be

used, all in moderation. Reason must rule over appetite. Water should be restricted in every form of fat-reducing diet except the meat and hot tea regimen. In that case water is necessary to defecate the tissues.

Diet for the Lean.

If a thin individual enjoys good health he had better be content and not interfere with the dispensations of nature. If leanness exists in spite of a good appetite the condition probably calls for careful attention. Wasting away or persistent leanness in spite of a liberal diet, is generally promptly cured by sweetbreads, eaten once a day, the other food remaining as usual. This peculiar action is probably due to the almost medicinal action of the minute amount of iodine which sweetbreads contain. The simple plan of eating candy, in addition to the ordinary meals, has proved very fattening in a number of cases. In one case popped rice, eaten at odd times during the day, proved so fat-producing that the patient was scarcely recognized by her friends in the course of a few months. The point is to add some palatable form of starch and sugar over and above the usual diet.

Diet in Typhoid Fever.

The various and opposite principles that have ruled at different periods, in regard to the feeding of typhoid fever patients, is a fine example of the pendulum-like oscillation of medical opinion. There was a time when fever patients were denied both food and drink to an extreme and arbitrary degree.

There was a time when they were overfed, especially with the mischievous beef-tea and beef-extract preparations. Then came the time of light diet, again followed by that celebrated Dr. Graves who desired for an epitaph "I fed fevers." He probably overdid it, for most standard works of the present time are in favor of a light diet.

Anders advises a liquid diet, chiefly plain milk diluted with water; the daily quantity to be not less than three pints. If this is not well borne a little brandy, coffee or tea is to be added. These failing or disagreeing, whey, sour milk or buttermilk are to be tried. When milk cannot be digested it may be replaced by meat broths, together with one of the standard infant foods, or by albumen-water suitably flavored.

Osler recommends milk, three pints at least in 24 hours, always diluted; if curds appear in the stool he advises the substitution of mutton, chicken or beef broths for all or part of the milk. He also says thin barley-gruel, strained, is an excellent food for typhoid-fever patients. Albumen-water flavored with lemon and fortified with whisky or brandy is also recommended by Osler. Such, or practically such, are the dietetic directions in most other standard works.

Medical opinion, however, never remains stationary; it swings like a pendulum; and Bushuyez has advocated a more liberal dietary. His typhoid patients begin the day with a roll and tea on waking; 8 a. m., 14 ounces of gruel with butter; 9 a. m., one or two boiled eggs; 10 a. m., a glass of milk, a roll, half a cutlet and a piece of boiled meat; 12 m., a bowl of soup and a little jelly; 3 p. m., tea

and a roll; 6 p. m., a cup of soup, a bit of chicken and milk pudding; 8 p. m., a roll and milk.

During the night, coffee or tea with milk is allowed several times. These ideas are gradually spreading and articles are occasionally appearing in the medical journals advocating the new liberal diet in typhoid. As soon as the plan is well established, the pendulum will swing to the other side, a reaction will occur and a period of light diet will follow.

Consider the following facts: Typhoid fever is characterized by great torpidity of the involuntary functions. Digestion and absorption are sluggish, the digestive juices are less active, the amount of hydrochloric acid in the stomach is diminished, the bile is less active and peristalsis is lessened. The intestines are ulcerated, and all food must pass through this inflamed, ulcerated, torpid tube, and in every membrane in the body osmosis is lessened. Put these facts alongside of that other important fact that it has been abundantly proved that entire abstinence from food may be endured with safety for forty days or more.

The deduction is plain; here is a condition of the system that needs rest from the functions of digestion and absorption, for it is only able to digest slowly and with difficulty and to absorb sluggishly. It has been proved that forty or more days' abstinence from food can be gone through with entire safety. It follows plainly that the typhoid-fever patient is better off without any food at all. The plan of feeding such a patient is simply part of the old, enrooted superstition, that when anything is wrong with the health, "take

something." It is always "take something" instead of giving the disordered organ rest.

The proper diet for the average typhoid-fever patient is water; water pure and fresh, cool or hot as desired, but only water. This is not theory alone; experience proves that patients so fed recover in a shorter time, they have fewer complications, with no sequelæ and no relapses. They do better than on any other diet that has ever been devised; its robs the disease of half its terrors and of more than half its dangers.

The advantages of this plan are, a short run of fever, few complications, slight sequelæ, infrequent relapses, rapid convalescence and speedy return of full vigor. This is the general rule for cases occurring in the well-fed or overfed people of the present day.

The exceptions are rare; they occur when an emaciated individual, already in a weak, half-starved condition, comes down with an attack of typhoid. Such cases are sure to show great exhaustion and signs of cardiac weakness, early in the course of the disease. We must here choose the less of two evils; the patient has no surplus of tissue on which to depend during the fever and we must therefore take the risk of putting food in his enfeebled system.

There is no natural appetite to serve as a guide and the physician must be directed by his observation of the digestive powers of his patient. The stools should be watched for undigested food and the effect of eating upon the temperature should be noticed.

The general rule should be protein-sparers during the fever, and tissue-builders after the fever

and during convalescence. The first class, to be used during the fever, includes gelatinoids and carbohydrates, such as acidulous gelatine preparations, and any starchy or saccharine preparations that agree with the patient. Rice water, thin tapioca or sago gruels, wine jelly, or lemon jelly, are examples of suitable foods for this period.

The second class includes such foods as eggs, milk and meat, strong protein foods for repairing the tissues after the fever is over. While the patient is still weak, albumen-water, or milk and lime water, are strong enough, but should be replaced by stronger preparations as the digestive powers become more capable of performing their functions.

Diet for Consumptives.

This formidable disease is so prevalent and so fatal that we should make no mistake in giving advice about its management, for every mistake is liable to work harm to thousands. Between 7,000 and 8,000 people died of consumption in 1904 in the state of Illinois alone. In situation, soil, climate and family comforts, Illinois is equal, or superior to, any state in the Union, so that this enormous death rate probably applies to the United States as a whole.

Consumption is a wasting disease, the fat of the body is first consumed, then the protein; the problem that confronts the dietetist is to keep in nutritional equilibrium a body that, in addition to the ordinary wear and tear of life, is being burned up by disease. The disease is well named "consumption." It is an obvious inference that an extra amount of food is needed and forced feeding

is now generally advised. This is a mistake. Food forced on the patient without appetite, or even with a disgust for it, is worse than wasted; it is a drag on the vitality. The exercise in the open air, very generally advised for all cases, is also a fatal mistake for those with fever. Exercise in the open air is excellent as a general proposition, but not for the consumptive. The same may be said of deep inspirations. Both of these should be recommended—highly recommended—as a means of preventing consumption in those who may be hereditarily inclined to it, but the disease once established, all this doctrine needs to be changed. Rest in the open air is what is needed, rest for the body and rest for the mind, freedom from physical labor, freedom from mental worry, and the whole existence in the open air, with as much of wisely selected food as the appetite demands, but not more.

When the fever abates, exercise should be gradually and guardedly substituted for the quietude of the acute stage. Smoke, vapors, dust, exercise, excitement and crowds should all be avoided. It is very rare that one sees a fat consumptive; it is therefore the fat of the body that is first used up as food for the disease; but very soon the protein of the body undergoes waste. With the idea of opposing the prevailing phthisical leanness, fatty food has been highly recommended. It has probably been carried to an extreme. When protein is undergoing rapid destruction, no amount of fat can replace a single molecule of it. The same is true of gelatine, although it has not been so extensively tried. Gelatine is a more powerful pro-

tein-sparer than fat, and more attention should be paid to supplying it in consumptive cases.

In a case of consumption, in a fair condition of strength, the attempt to spare the patient's protein by gelatine and fat should be made. Gelatine preparations and bacon, butter and olive oil should be eaten to the full extent of the appetite at regular meals. Other foods are not interdicted, of course, but these should occupy first place. If this diet, with rest in the open air, prevents loss of body weight and lessens the fever, well and good; nothing more is necessary except the cautious and gradual substitution of exercise for the rest previously enforced.

If, however, loss of weight keeps on, with daily fever, this class of food should be put aside and the chief place given to tissue-builders, i. e., meat, milk and eggs. The particular articles of food may be varied to suit the appetite of the patient, but the general principle should rule of having protein in some form occupy the chief place. This method is many times better than the indiscriminate forcing of fat food on the patient with the result of producing a chronic distaste for all food.

Doctor Russell of New York, whose experience with consumptives is very large, recommends forced feeding with fat, and the use of the uncooked juice of fresh, succulent vegetables. If his results are carefully studied and the effects of energetic, methodical care upon such cases are discounted, this plan will not be found better than many others. It has been applied energetically and methodically to a large number of cases, hence the good results. It is certain that neither the vege-

table juices nor the suet emulsion are a cure for consumption, and too much emphasis should not be placed upon them. The good results are due to care in place of neglect, attention in place of indifference, cleanliness in place of filth, and outdoor air in place of the poisoned air of stuffy and infected rooms. These things should first be attended to, then a fatty and gelatinous diet to the full extent of the patient's appetite, but not more. If the subcutaneous fat of the patient has all been used up, then increase protein in the food rather than fat. Very few consumptives need die of consumption if the above details are strictly carried out.

Spices and Condiments.

In general these articles are devoid of nutritive value: they increase the palatability of food and often by their delicate and appetizing flavor cause people to eat more than is good for them. They stimulate the flow of saliva and of the gastric juice by virtue of their heating and carminative properties, and produce a subsequent languor in the digestive organs. By accustoming the palate to high flavors they dull it and make it insensible to the hundred and one delicate natural flavors of unseasoned food.

The black and white pepper produce a stimulating and congestive effect upon the urethra; in sensitive individuals this effect may be very annoying.

Cayenne or red pepper when much used or in sensitive temperaments, produces considerable relaxation, especially of the rectal tissues.

Nutmeg has a powerful medicinal action; it

frequently causes dryness of the mouth and a stupid, sleepy condition.

Condiments should have a very slight place in the kitchen and no place at all with those who desire to cultivate a delicate perception of the delicious natural flavors of plain food.

Baking Powders.

The large financial interest involved in the baking powder business is responsible for the industrious dissemination of much misinformation upon the subject.

The testimony of experts and chemists was abundantly used, and it cannot be said that the clear-eyed goddess Truth had much to do with the matter. The safest course for the public would be to reject all proprietary baking powders; the housewife or cook should learn how to make baking powder; it should be made in every kitchen.

Many of the much advertised powders contain some form of alum salt. Many contain some salt of phosphoric acid, none of which should be used.

The levigation of dough by means of baking powders is the least sanitary method of any that is used. It has, however, the advantage of saving time and trouble, and also of requiring little skill in the cook. In its best form, baking powder cannot be said to be very insanitary. No baking powders on the market, so far as they have been examined by me, were found free from objectionable features, except one sample made by a very small manufacturer who did all his own retailing. In this case purity was probably owing to the manufacturer's ignorance of how to adulterate. The safest

rule is to reject all commercial varieties and make your own product, by the following formula:

Cream of tartar (guaranteed 99 per cent). 1 pound
Sodium bicarbonate (baking soda) ..... ½ pound
Cornstarch ..... ½ pound

Mix thoroughly by sifting several times through a moderately fine sieve, and keep in a well-corked bottle.

Cream of tartar is frequently adulterated with a considerable per cent of calcium tartrate, but the "guaranteed 99 per cent" can easily be obtained and should be insisted on.

NOTES.

I. The lack of uniformity in the nomenclature of the principles of food has resulted in some degree of confusion. In some works, the term proteids refers to what is here called albuminoids, and the term albuminoids to what is here called gelatinoïds. The names and classification given in the text are the ones recommended at a recent meeting of the American Association of Agricultural Colleges and Experiment Stations. In the interests of uniformity it should be generally adopted by all writers upon the subject.

II. There probably exist numerous particulars in the role performed by various foods, which is not adequately indicated by any of its threefold functions, and with which we are very slightly acquainted. No modern writers, so far as we know, allow for any other function than the supply of the necessary elements for the maintenance of tissue-integrity and the production of heat and energy. Hutchinson says: "It is a matter of indifference, as far as the cells of the body are concerned, whether we feed a man on egg-white, gelatin, butter or sugar, always supposing that these are supplied in the proportion of their dynamic equivalents." In opposition to this doctrine is the fact that during pregnancy and in states of ill-health there often exists a strong craving for some particular article of food, which no other article, not even the exact dynamic equivalent of the one craved, will satisfy. The benefit frequently experienced from the gratification of such cravings seems to argue an organic need of that article rather than a mere appetite or fancy.

Then, again, what is commonly classed under the head of idiosyncrasy is really a peculiar effect or function of food, over and above the three general ones. Fresh milk, for instance, produces diarrhœa in certain indi-

viduals; eggs cause headache, gastric catarrh and sulphureous eructations with some people; cornmeal, an excellent food for most people, is productive of headache and fever in others. Veal frequently causes diarrhœa; shell fish are responsible for many cases of urticaria. A fine itching rash is a not infrequent result of the buckwheat season, when buckwheat cakes are found on almost every breakfast table. There is nothing intrinsically improbable about the long continued use of certain foods producing certain results in the human body. There is nothing to be gained by a blunt denial, without investigation; what is needed is experiment and observation upon the subject.

III. Before the recent experiments of Atwater, with improved apparatus, the figures were:

Protein	4.1	Calories
Carbohydrates	4.1	"
Fat	9.3	"

IV. Fine white bread receives very unjust treatment at the hands of some of the would-be reformers in the popular health magazines and daily papers; it has been pronounced a poison and deleterious to health by a popular writer, who counts her readers by the hundred thousand; one health journal, with a very large circulation, calls it absolutely innutritious and "devoid of nutritive value."

It is unfortunate that writers who have the ability to command the attention of such a large number of readers should take so little trouble to ascertain the facts of the matter. They write rather from prejudice than from truth.

It has been proved to a superfluity that white bread made from patent flour yields more nourishment than the coarser breads, such as Graham. Here are the facts in a summary:

Of Graham, entire-wheat and patent flours, all milled from the same lot of hard spring wheat, the patent flour yielded a larger percentage of available protein and available energy than either of the other two. By chemical analysis the Graham flour contained the highest per cent and the patent flour the lowest of protein; the lower digestibility of the coarser flour bread is due to the fact

that a considerable portion of its protein is in the bran, and so resists the action of the digestive juices and escapes digestion.

The reputation of the coarser breads is based upon chemical analyses, uncorrected by experiments with actual digestion

The fine white bread is a better food for muscular labor, for it gives up more energy weight for weight. The coarser flour breads, however, have certain advantages; they are better for sedentary livers, for constipated individuals and for children.

V. The great value of the potato in scurvy is strikingly illustrated in Dana's account of a voyage from California to Boston in his "Two Years Before the Mast." One of the crew afflicted with scurvy was nearly *in extremis;* the teeth were completely concealed in the swollen and bleeding gums. Raw potato, scraped, and the pulp placed on his tongue, effected a speedy cure.

VI. The sulphur in mustard and horseradish is plainly shown by the blackening effect they have upon silver spoons.

VII. Warren Hastings always attributed the smallness of his stature and his slender figure to the hard and scanty fare of the school at Newington, near London, which he attended at the growing age of eight.

VIII. Normal salt solution, in a surgical and therapeutic sense, should be carefully distinguished from normal salt solution in a chemical sense. When normal salt solution is spoken of in the first sense, a .6 per cent solution is referred to; it is approximately a slightly heaping teaspoonful to a quart of lukewarm water (86 grains to a quart). In a chemical sense the same name applies to 58.8 grams to the liter, a solution nine times as strong as the other.

IX. Unfortunately there is no reliable test for acetone in the urine that does not involve distillation, a process that not many practitioners have the conveniences for performing. The following test does not certainly show acetone to be present, but it is significant enough to indicate that the carbohydrates had better be increased.

Add 12 drops of liquor ferri chloridi to one-half fluid-

ounce of the urine. Filter through paper to remove the precipitated phosphates, and to the clear filtrate add 12 more drops; a claret red shows the probable presence of acetone and indicates a greater liberality in carbohydrates. The non-appearance of the claret color shows absence of acetone.

X. Acting upon the theory that the muscular stiffness of violent exercise is due to a local acidity of the muscles, with precipitation of colloid uric acid or its congeners, I have prescribed 30 to 50 grains of sodium bicarbonate, in a well diluted solution, shortly after severe exertion, such as a foot race or a prize fight, with marked success. The increase in the alkalinity of the fluids of the body redissolves the precipitated substance and carries it off into the general circulation, to be subsequently eliminated.

XI. The uses of hunger in the treatment of disease have not been sufficiently studied. In this age of abundance, many people never get hungry; they keep themselves in a chronic state of repletion and invalidism, with no appetency for food and no vigor of body. We advise anyone troubled with a chronic lack of appetite to simply drop the accustomed meals and fast until appetite comes. Outdoor exercise at the same time will greatly accelerate the successful result.

XII. The disagreeable and distressing effects of potassium iodide are greatly lessened by copious dilution with water. Hence, during a course of this drug, it is usually advisable to have the patient drink copiously of water.

If, from any reason, water cannot be allowed, as in aneurism, a correspondingly small dose of the iodide must be used, and will then be found to have a nearly equal effect.